VISUALIZING PORT HISTORY: AN HISTORICAL AND ARCHAEOLOGICAL RECONSTRUCTION OF WASHINGTON, NORTH CAROLINA'S HISTORIC WATERFRONT

By

Matthew Lowe

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Director: Dr. Nathan Richards

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The purpose of this thesis is to combine new techniques of archaeological inquiry with established methods of data collection to gain a new understanding of the ways in which ports adapt over time. Ports and harbors have long been integral facets into the economic and social fabric of trade in the United States. However, over the past century, regional ports have been increasingly replaced by larger, centralized, port systems. The historic port of Washington, North Carolina, situated on the Tar-Pamlico River will be used as a case study to determine what economic factors contributed to its eventual decline. This study combines historical data, archaeological data, and three-dimensional reconstructions to analyze possible correlations between commodity production and waterfront commerce.

Visualizing Port History: An Historical and Archaeological Reconstruction of Washington, North Carolina's Historic Waterfront

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APPROVED BY DIRECTOR OF THESIS: _____
(Nathan Richards, PhD.)

COMMITTEE MEMBER: _____
(Jason T. Raupp, PhD.)

COMMITTEE MEMBER: _____
(Christopher Oakley, PhD.)

CHAIR OF THE DEPARTMENT OF HISTORY: _____
(Jennifer McKinnon, PhD.)

DEAN OF THE GRADUATE SCHOOL: _____
(Paul J. Gemperline, PhD.)

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1: INTRODUCTION

Since the birth of maritime archaeology as a subdiscipline, the majority of the research has centered around shipwrecks such as the RMS *Titanic* (Michel and Ballard 1994), USS *Monitor* (Holloway 2012), or the CSS *Hunley* (Conlin and Russel 2006). While such sites are integral to understanding historical waterborne trade, the facilities that support those vessels are equally important. Regional ports serve in the littoral zone between the hinterlands and outgoing waterborne trade. They serve as areas of cultural exchange where ideas, goods, and capital from distant places meet, and have held these functions throughout history. Ports are also not static fixtures free of change or development. Their structures and functions have varied throughout history, responding to regional and global change. They evolved through the centuries from little more than beach landings to sophisticated systems supported by industry, dockyards, custom houses, and much more. However, they remain relatively understudied in the field of maritime archaeology. This is especially true when trying to determine the economic factors that pushed or pulled against them, and their possible responses to these factors.

This thesis aims to help rectify those shortcomings through a case study focused on Washington, North Carolina's historic waterfront. Situated on the north shore of the Tar-Pamlico River (Figure 1), it offers an excellent opportunity to study the economics of an early modern port and help fill a historical void about the history of Washington's waterfront after the turn of the 20th century. The circumstances of the current state of Washington's waterfront require new techniques to research this interesting part of North Carolina history. The town demolished its historic waterfront and filled it in over half a century ago to create a new, recreational waterfront.

FIGURE 1: A Map of North Carolina from 1804 Showing Washington and its location on the Tar-Pamlico River (Carey, Matthew:1804). Carey's American Atlas: Containing Twenty Maps and One Chart. Arrow added by author.

Even though this is the case, extensive research can still be conducted on the evolution of the port. This thesis combines underwater archaeological survey data, historical economic data, and three-dimensional (3D) reconstructions to create a clearer picture of the historic port of Washington, the industries that sustained it, and the way in which it evolved to meet the demands of an ever-changing world.

While the decline of Washington's waterfront is the case study examined here, the types of events that precipitated its fall are not necessarily unique to Washington. Throughout the Western world during the early 20th century, small regional ports endured the same global trends

that led to Washington's industry disappearing. Throughout history, the relationship between ports and vessels remained relatively stable. There existed a continuity between classes of ships and the ports in which they docked. Smaller vessels traded with smaller ports while larger vessels berthed at larger ports. Traders conducted their business at the ports of their choosing and ports sustained that trade by providing goods from the surrounding hinterland. However, as the 20th century progressed, the historical relationship between the two began to strain. Shipping and trade became more centralized. Trade increasingly flowed only into larger ports that could manage new container vessels. By the second half of the 20th century this trend solidified, additionally the connectivity of roads and railway lines made small scale shipping impractical (Litchfield 1976:234). The decline of the small regional port was ubiquitous in the western world during the early to mid-20th century. Studying this series of events is crucial to understanding the process and effects it had on the towns that historically supported those ports.

Thesis Objectives

Previous research and historical sources indicate that the port of Washington, once founded, flourished as a hub for passenger and commercial travel through the swampy terrain of Eastern North Carolina. The lack of roads and railways and the central location of Washington in the region allowed the port to expand and grow throughout the 18th and 19th centuries. The variety of trade that flowed through the port supported by hinterland agriculture and the surrounding pine forests helped the town grow rapidly through the first half of the 19th century (Paschal 1976:1-5). The Civil War stunted the growth of the town only for the duration of the conflict but did not hamper Washington's ability to recover from the devastation of the war and recover its position as the primary trading hub of the region (Warren 1976:45). The town

regained its footing and continued its prosperous trade through the end of the century. Railroads soon became the preeminent method of transporting goods and passengers and by the 1910s the waterfront trade became unprofitable and impractical (Litchfield 1976:234).

Further studies on the fate of the waterfront are surprisingly lacking. Investigations into the economics of the port past the first and second decade of the 20th century are sparse. This research aims to rectify this apparent hole in research by correlating economic trends of the town with 3D reconstructions of a specific set of years between 1885 and 1943 which may shed further insight into the operations of the town after most historical narratives write it off. Further archaeological data of the historic port is combined with 3D reconstructions to find and investigate existing subsurface structures.

Previous Research

While earlier investigations of the economics of the historical waterfront are sparse, researchers have conducted many studies in and around Washington related to its history and archaeological remains. Many of those studies were conducted by East Carolina University history graduate students. Work has also been conducted on ports around the globe which help give a theoretical understanding to their development.

Alicia Kramer's (1996) thesis "The Pamlico Oyster, Crab, and Shrimp Industries: Early 20th Century" is an historical account of the fishing and shellfish industry in the Pamlico Sound during the 20th century. While it was not focused specifically on the production of these products in Washington, it gives an account for the region in which Washington is found. This was crucial in revealing the importance of aquatic resource harvesting in the area, which plays a part later in this thesis.

Chris McCabe's (2007) thesis "The Development and Decline of Tar-Pamlico River Maritime Commerce and its Impact upon Regional Settlement Patterns" is historically focused research on the commerce of the Tar-Pamlico River. Washington, as a trading hub within the larger Eastern North Carolina trading network was examined. While no archaeological data was gathered, it helps illuminate the need for further research into the town.

The most recent research is Will Nassif's (2020) thesis "Reconstructing the Waterfront: An Historical and Archaeological Reconstruction of the Nineteenth Century Port of Washington, NC". This work is related to the south shore landing site, across the Pamlico River from the port of Washington. That area contained various types of industrial production, most notably of which was turpentine. However, this study ends at the turn of the 20th century when the demand for goods produced in that area diminished and the businesses closed or left.

Another ECU thesis of relevance is Sara Parkin's (2019) "Reconstructing Buffalo City (1887-1986): Applying Archaeological Site Reconstruction Techniques to a North Carolina Maritime Entrepot". Parkin's study used the same Rhinoceros 3D (Rhino) 7 software that will be utilized later in this thesis and exemplified the potential for 3D reconstruction in archaeology as a valid avenue of inquiry.

Other historical sources were consulted such as Michael Hill's (1984) *Historical Research Report: The Waterfront Area of Washington, North Carolina* which gave a historical account of the Washington waterfront and helped further contextualize the economic role it played within the surrounding region. Louis Van Camp's (2000) book *Washington, North Carolina* discussed the town of Washington rather than specifically its waterfront, however, it provided vital information on the waterfront industries of the early 20th century. The most expansive historical source consulted was Ursula Loy and Pauline Worthy's (1976) edited book

Washington and the Pamlico. A commission for the 1976 bicentennial celebration of the founding of Washington, it presents a collection of essays by local historians of significant events in Washington up to 1976. This book offered integral information related to the town prior to the Civil War, the reconstruction period, its growth, and the waterfront's decline.

Work on the role that ports have played around the globe was also an important facet to understand the theoretical approaches that help frame the rest of this work. Gordan Jackson's (1983) book *The History and Archaeology of Ports* was a great starting point. It gave a historical and morphological assessment for the ports of Great Britain from the 1600s through 1983. The changes and adaptations of ports is discussed through the world wars and the container revolution. It gave insight into the ways that port systems interact and evolve with the wider world. B.S. Hoyle and D. Hilling's edited book *Seaport Systems and Spatial Change: Technology, Industry, and Development Strategies* (1984) provided a geographic perspective on ports. This collection of geographic essays with case studies of ports around the world considers whether the geographic location of those ports was an advantage or detriment to their success. This book helped frame Washington within its geographic location and the ways in which that might have helped or harmed its growth. Finally, editors Tapio Bergholm, Lewis R. Fischer, and M. Elizabeth Tonizzi in their book (2007) *Making Global and Local Connections: Historical Perspectives on Ports* provided a geographic and historical approach to port development. This book is also a collection of essays from geographers, historians, and economists who wrote about various case studies around the world. It was crucial to gaining a holistic understanding of how economics, geography, and history all play a part in determining the success of port systems.

All these studies, reports, and books helped form the research design that guides this thesis. The historical background of the port, the lack of archaeological research of the port, a

proven way to go about the research, and the theoretical framework in which to place the research all form the foundation of the investigation conducted in this study.

Research Questions

This research will use historic economic data, archaeological data, and 3D reconstructions to answer the question, *can a visual reconstruction of the progression of Washington's waterfront provide an adequate assessment as to why and how the industry of the waterfront declined and eventually disappeared?* To answer this primary question, secondary questions have been established that will help conduct and focus the study. These secondary questions include:

- What contributing economic factors led to the decline of the waterfront industries?
- Was the decrease of trade the primary factor for the dissipation and eventual abandonment of the industrial waterfront?
- Does this methodology provide a viable option for further research, both inside and outside of academia?

The 3D reconstructions imbued with historical economic and archaeological data is the driving force behind answering these proposed questions. Another, more abstract objective of this thesis, is determining if this methodology is viable for use in further research or public outreach. A chronological reconstruction and subsequent investigation of a port using this archaeological methodology has not yet been conducted by any students at East Carolina University. Thus, this study presents a case study into possible future uses of this type of research.

Thesis Structure

This thesis consists of seven chapters. “Chapter One: Introduction” gives a brief introduction to the thesis topic and includes a brief history of Washington, the previous research into this topic, and the importance of this study. It also includes the objectives of this thesis and the questions that guides the research.

“Chapter Two: Theories of Port Development” explains the driving theoretical approaches that helped to frame this research. The morphological, geographic, and historical changes to ports over the centuries helps to contextualize the following chapter. “Chapter Three: History of Washington, North Carolina’s Waterfront Industries” provides a detailed description of the history of the port of Washington during the period studied in this thesis. A description of the early growth of the town is followed by its place within the context of the Civil War, which is followed by discussions of the reconstruction era, its rise to prominence, stagnation, and further decline.

“Chapter Four: Methodology” details the various methods used through this research. These include historical data collection, the process of reconstruction using Photoshop and Rhino 7 software, the presentation of the reconstruction results, the processing of archaeological data, and the procedures used to analyze collected datasets. This leads into “Chapter Five: Modelling Washington’s Economic Change, a Year-By-Year Synopsis.” This chapter deals with the results of the study and presents reconstructions of the waterfront in a series of 3D models, presented in chronological order, and where historical data has been embedded within model datasets.

“Chapter 6: Economic and Visualization Analysis of Washington’s Waterfront” repackages Chapter 5’s datasets in a comparative and diachronic fashion to present a picture of an evolving

waterfront. Washington's industrial waterfront is analyzed using models as visualization tools and paired with economic data, and in doing so, the secondary thesis questions are answered. "Chapter 7: Conclusions" provides a recapitulation of the findings of the research and sums up the overall conclusions about the study. This chapter also describes deficiencies in this work, as well as possible avenues of future research.

CHAPTER 2: THEORIES OF PORT DEVELOPMENT

Introduction

Since the inception of maritime archaeology as a subdiscipline of archaeology, maritime archaeologists have been primarily concerned with studying the vessels which have plied the oceans' waters for millennia. This focus on vessels, however, is not the only form of academic investigation that maritime archaeologists can conduct. Another area of inquiry relates to ports. Ports inhabit the region of liminal space between the water and land. They are a point of transition from one element to another and as such they can provide valuable insights into the trading, business, and cultural processes of the past (Rogers 2011:4).

The recognition and study of this liminal space is necessary because the development of ports has shifted completely from waterfront industry and business to separate outports that do not produce the same kind of interactions which traditional ports have for most of human history. Historically, ports have been located within urban centers, with many situated near commercial hubs of towns or cities. However, the mid-20th century saw the beginning of a trend that split urban-commercial centers from ports. Modernization, globalization, and increased scale, among other factors, led to this spatial and functional divergence. Since the modernization and increased scale of maritime commerce, this gap has only grown (Hayuth 1982:219).

This ever-widening divide had a devastating effect on many small, regional-industrial ports. The globalized economies of scale have outcompeted small ports and their ability to stay relevant in an ever-changing world economy. The western world by the 1950s shifted into a stage of high mass consumption. Simultaneously the small packet traders of earlier centuries

with their logistical bases in regional ports became unprofitable and eventually disappeared (Rostow 1960:10).

Though the systematic research of ports and their development is relatively understudied archaeologically, there are both historical and economic theories that describe how this transition took place. The first approach is historical and morphological in nature and is espoused in Gordon Jackson's book *The History and Archaeology of Ports* (1983). This book details the rise and fall of Great Britain's regional and larger ports from a historical and archaeological perspective. These ports grew from the trade that they received, and that exchange was based on the production of goods and products in the hinterland of the region. The regional economies, their rise and fall, and how that change effected the trade of the regional ports is discussed. Jackson asserts that once those regional economies collapsed due to various factors including technological innovation, the regional trading port centers and their economies collapsed with them (Jackson 1983:47).

The second approach focuses on the geographic and spatial relationships of regional and cosmopolitan ports to the overall local and global economy. This theory is argued by geographers and economists who place local ports within their relationship to other regional and international ports of the area. This view is argued by geographers such as B.S. Hoyle and D. Hilling in their book *Seaport Systems and Spatial Change: Technology, Industry, and Development Strategies* (1984). They link the geographic locations of ports and discuss their relationship between the hinterland and wider markets to the economic downfall of regional ports. They assert that the success of ports in advanced economies are dependent on two factors of interport competition and locational characteristics. These factors push and pull, and most small, regional ports were outcompeted and in the wrong location to produce lasting success in a

technologically and logistically advancing world (Hoyle and Hilling 1984:2). This argument is supported by larger, more general economic theorists such as W.W. Rostow who theorizes the stages of economic development of nations in his book *The Stages of Economic Growth* (1960). These five stages include: The Traditional Society, The Preconditions for Take-off, The Take-off, The Drive to Maturity, and The Age of Mass-Consumption (Rostow 1960:3). Though details about ports and their development do not plainly appear in the text, larger issues of growth and decline in economies are used to provide evidence to support Hoyle and Hilling's claim.

The third argument is a combination of both historical and geographic theories. Exemplified by Tapio Bergholm, Lewis R. Fischer, and M. Elisabeth Tonizzi's edited book *Making Global and Local Connections: Historical Perspectives on Ports* (2007), which provides a holistic approach to the issue with historical, geographic, and economic data used to discuss the global market interplays, technological and transportation innovations, and socio-economic relationships that led to the changing nature of modern-day ports (Bergholm et al. 2007:vii).

In this chapter each theoretical perspective is discussed in detail to create a suitable framework. The historical/morphological perspective is investigated first, followed by a discussion of the geographic/spatial/economic theory, and then an assessment of the combined historical/economic approach. This will supply a foundation of theoretical approaches that is utilized further in this thesis.

Historical-Morphological Approach

In his book *The History and Archaeology of Ports*, Gordon Jackson gives a thorough accounting of the ports of Great Britain and the ways they expanded and contracted from the mid-15th century through the late-20th century. Using an historical approach, he tracks the

morphological changes of ports as they adapt to the changing trade systems of the British Isles and larger British Empire. He describes these changes in six distinct historic periods: The Rise of Ports 1450-1660; Harbour Developments and Port Improvement, 1660-1840; The Emergence of Dock Systems, 1690-1840; Expansion, New Docks and New Ports, 1840-1870; The Height of Prosperity, 1870-1914; Stagnation and Decay, 1919-1980. Jackson then classifies the various harbor and port developments over the centuries as products of increased trade. He asserts that docks in the United Kingdom grew because of the trade that flowed through them, rather than trade being attracted by a good dock system (Jackson 1983:47). Although this theory is based on British ports, the model can be applied and compared to American ports such as Washington, North Carolina.

The Rise of Ports, 1450-1660

Jackson argues that the rise of ports in the 15th century was due to increased population and an increased demand for regional materials that began to appear in Europe. Local communication networks were also poor enough that many people who lived on the coasts looked toward the sea rather than land for transportation and communication. The third factor that he describes is the inability of beaches and local landings to support any meaningful trade systems. As trade began to flourish, more organized and centralized areas of transactions were subsequently established. Ports were initially placed wherever convenient, but as trade and demand increased through the 16th century, outports and places of convenience began to decline. Many could not handle the trade volume, which was expected, some had less than ideal locations on slow moving waterways, and some simply succumbed to erosion and natural deterioration. As these small outports declined, larger ports such as London began to rise and take over the

regional trade (Jackson 1983:14-19). The establishment of the British Empire and international trade further changed the nature of British port development.

By the 17th century trade conflicts with the Dutch abated while ascendency in the East Indies and dominance in North America established the British Isles as a central location for European trade. Trade with the Baltic States, Ireland, Scotland, the European continent, and the British colonies helped revive some outports that were previously in decline such as Bristol, Hull, and Liverpool. Increased demand for British goods also helped propel the development of ports. The coastal trade also flourished with many ports only conducting local and regional trade (Jackson 1983:24-29).

Harbour Developments and Port Improvement, 1660-1840

By the late 18th century, the industrial revolution was underway and British port trade volume increased with demand in kind. Though some ports adapted to the increases in volume, a large number did not. Jackson divides these unimproved harbors into three categories: one is where the level of trade was unable to financially provide for port improvements, the second were prosperous small ports which chiefly traded agricultural goods from slow growing hinterlands that did not cause congestion, and the third were prosperous large ports serving rapidly developing hinterlands but had natural harbors large enough to accommodate increased trade. Many of the ports which were not financially able to provide any kind of physical improvements fell into decay. The more prosperous ports, however, did not need substantial improvement and were successful in dealing with the increased shipping volume (Jackson 1983:30-33).

Riverine ports were also prolific during the 18th century, and many suffered from silting which required large investments and oftentimes questionable solutions to the problem. This caused most of the river ports to lose in the long run; shortages of money and continuous dredging operations ran most of them into the ground. Some coastal ports were developed or built during this time as well. Pier ports were created on open coastlines with piers built out and/or parallel to the tide to create an artificial barrier between the harbor and the surf. These types of artificial ports were primarily suited for the transportation of minerals which could easily be transported down the steep cliffs that were a predominant geologic feature of artificial port areas. Harbors of refuge were also established throughout the 18th century on coastlines to provide safe locations for vessels in particularly treacherous waters or if storms arose, though these types of ports were of mixed success. At Ramsgate two large piers were constructed perpendicular to the shoreline and provided a safe entryway into the basin which ships could anchor. However, the lack of trade that Ramsgate provided made the effort of little commercial value. The port of Dover provided greater success as trade with France across the English Channel sustained longer term growth. The development of smaller ports saw mixed success during this time and while important innovations were taking place, they did not always provide a solution to the problem of low levels of trade (Jackson 1983:33-41).

The Emergence of Dock Systems 1690-1840

Though ports and harbors provided centers of trade and places of refuge, larger issues began to occur with port systems that they were not predisposed to face. Jackson describes the next phase of port development as the arrival and integration of docks into larger port systems. From the late 17th through the mid-19th centuries, dock systems were established throughout

English ports. Docks were initially developed to handle the laying up of ships for non-trading seasons such as winter or for vessels that were staying in the port for longer periods of time. Jackson asserts that these early dock systems developed within ports of cities such as London and Bristol and were non-commercial. This is exemplified by the Howland dock which did not have any kind of warehouses, customs houses, or ancillary trade structures. The initial dock system was only for the laying up of vessels while they were not in use to free up space on the busy commercial ports (Jackson 1983:44-45).

In 1715, Liverpool was the first British port to combine the dock system with the commercial center of the port. They accomplished this by constructing a dock that was near enough to the commercial port and included storage facilities for trade goods. The successful implementation of this idea spurred a frenzy of dock development through the 18th century. Hull soon followed with a larger dock that was located inland rather than placed on water frontage as was the case with Liverpool. Bristol, London, and other ports began dock construction as well. There were a few problems, however, with the ways in which port and dock development continued. One problem was flooding which could destroy ships and their support piers and quays. The other was centered around the tides; when tides went out vessels would remain stranded and might incur structural damage. This issue was solved by the Floating Harbor of Bristol, which was able to permanently keep vessels afloat and keep the water level stable within the dock through a feeder canal from the Avon River. Though a seemingly obvious solution to this problem, the development of these kinds of dock systems was integral to the growth of maritime trade. As trade expanded, more and larger ships appeared which necessitated the construction of systems such as the Liverpool dock and the Bristol Floating Harbor. Larger dock

systems and harbors began to develop and expand at a faster rate due to the economic incentives brought on by higher numbers of trade vessels (Jackson 1983:44-48, 52-53).

Expansion: New Docks and New Ports, 1840-1870

The next phase of port development appeared on the back of the industrial revolution and the new technologies that appeared in the subsequent years. Jackson argues that prosperous trade, the steamship, and introduction of the railroad all played a massive role in changing the nature of ports. The 'old' commercial, city center-based ports began to be replaced with systems adequate to handle new technologies in the years from 1840-1870 (Jackson 1983:73).

Prosperous trade led to the creation of larger ships which began to stress the old port systems that were not suitable to serve larger vessels. Ships could be tied up in port for weeks at a time and the design of the old docks did not account for this specific need. A solution for this problem was found in the mid-19th century with the development of internal pier systems. These piers would extend perpendicular from the dock, and they created large amounts of extra space to keep vessels. After this development, docks became either long and narrow to service many ships, or they required internal piers to be able to service an adequate number of vessels. Increased trade also necessitated the construction of quayside warehouses such as the ones built in London. These two innovations changed the face of ports and their subsidiary docks to a point where they did not resemble earlier ports and began to take the shape of modern ports (Jackson 1983:73-74).

The introduction of the steamship in the early and mid-19th century added to the problems of port systems not adapted to the new type of vessel. Steamers were an entirely new class of ship that required different parameters of movement from traditional sailing vessels. One

steamer, *Wilberforce,* at 190 feet long and 38 feet wide needed at least three times its length in space to maneuver while coming to the Hull dock. Steamships required rapid entry and exits to ports and could not be stacked close or against each other like sailing vessels. The issue of space versus efficiency created a massive dilemma for port authorities who tried to build new docks to keep up with demand, however, these constructions would not come to fruition due to the introduction of the railroad (Jackson 1983:74-75).

The integration of railroads into port systems seems like a forgone conclusion in hindsight, yet many ports were not built with express interest to hinterland connection. Railroads disrupted this traditional way of designing port systems. Old ports needed to be adapted to new technologies, railroads were difficult to incorporate into port systems that did not plan for them from the outset. The port of Hull for instance, floundered with its initial railway investments while the monopolized London docks, which had planned for railroad integration into separate dock areas, adapted with little trouble (Jackson 1983:80-83).

The creation of modern ports would not be complete without the addition of steam cranes and machinery. This development changed the dockside characteristics of the port along with railroads. In increasing numbers, cargo was no longer hauled by men but by hydraulic machinery. The use of mechanical dredges also began to appear and replaced other, more rudimentary methods of excavation (Jackson 1983:96-104).

The Height of Prosperity, 1870-1914

The next phase of historical port development occurred from 1870 to 1914 which Jackson argues this is the height of prosperity for ports. This period of economic boom was due to many

factors. The integration of railways and steamships was a new method of faster and cheaper transportation. However, these new technologies did not overwhelm the more traditional methods of shipborne transportation such as sail. This allowed for ports to service a wide range of vessels (Jackson 1983:114).

Global demand for consumer products caused an increase in the demand for bulk goods both exported and imported into Great Britain. Due to these demand spikes, ship size and tonnage increased. While small packet traders were still utilized, cargo transportation vessels became increasingly large. The size range of these vessels meant that during this period small ports were generally still relevant while larger ports such as London, Liverpool, and Bristol had to adapt to cater to larger vessels. Port improvements to the larger docks meant general improvements to the wharves and quays, increasing the size of locks and dock space while also increasing the warehouse capacity on shore. There was also the further integration of steam power on the docks including expanded railway connections and steam cranes. While port investments were extremely expensive, it was the larger ports which could incur and sustain the costs while the smaller ports generally did not have to go bankrupt trying to catch up to market forces (Jackson 1983:114-126).

Railway connections to minor ports was one of the main integrations happening to regional trading centers during this time. The consistent building of railroads from the hinterlands into ports initially expanded trading opportunities and did not take too much away from the importance of waterfronts. Many of these railroads helped the port system expand. However, these positive trends eventually reversed with new technologies playing an increasingly important role in transportation leading to the demise of many ports both big and small (Jackson 1983:136-138).

Stagnation and Decay, 1919-1980

The First World War slashed the economic boom that had overtaken the world during the prior fifty years. Due to the desire to a return to normalcy, at least in Great Britain, there was a corresponding decrease in the desire to adapt to changes in shipping. Though trade recovered to a seemingly normal level by the late 1920s, drastic changes in shipping occurred that many ports were not prepared to handle. While the amount of trade was stable, ship numbers decreased while their corresponding tonnage values increased. This centralization of maritime trade continued with increases in long distance trade that required larger ships and specialized facilities. The bulk trade of oil exemplifies this trend as it necessitated specific ships and port facilities to carry the commodities. The depression of the 1930s further hampered trade and the construction or improvements of port facilities (Jackson 1983:140-160).

The shipping revolution which occurred after the Second World War solidified this mold. The invention of the forklift in 1950 made it natural for the creation of wooden pallets that could hold multiple boxes or barrels of goods. Even though this invention on the surface would seem like a great assistance to small ports due to increased efficiency, it called for the immediate restructuring of those small ports. Paved, concrete quays were now required for the successful transfer of goods using a forklift. The warehouses as well needed to adapt to the heights that forklifts could reach which meant that the usual low-level ceilings of warehouses needed to be raised to increase the storage space (Jackson 1983:151-153).

Port system stresses increased with the simultaneous inventions of "Roll on/Roll" off cargo transfer (Ro/Ro) and containerization. By this point, however, Ro/Ro shipping required little adjustment to the standard practices of a port. Floating pontoons or adjustable ramps are all the Ro/Ro ships needed to unload their cargo and these could be easily and cheaply built and

added to existing port structures. The cargo was also generally self-propelled, which required no additional crane or equipment to accommodate shipments. The final nail on the coffin of the old port system was the introduction of the container in 1950. It became apparent to port authorities that to increase trade volume, containerization that had begun to develop in the Second World War would need to be adopted. The old port systems were generally too worn out and small to accommodate this last piece of the shipping revolution. The flow of trade coming and going from smaller coastal ports began to wane as the traffic shifted to larger and more well-equipped ports. Small haul cargo ships were supplanted by the large container vessels that ply the oceans today. Container transportation was tested throughout the 1960s in American waters and by the 1970s began to take over all transatlantic trade. These monumental shifts in maritime shipping have continued to dominate trade through the present (Jackson 1983:152-155).

Through his book, *The History and Archaeology of Ports* (1983), Gordon Jackson details the five stages of developments that the ports of Great Britain took through the centuries. Though this theoretical perspective is focused on British ports, this historical approach can be applied to other western ports such as those located in North America.

Geographic-Spatial Approach

Geographers B.S. Hoyle and D. Hilling outline a geographic-spatial theoretical approach in their book, *Seaport Systems and Spatial Change: Technology, Industry, and Development Strategies* (1984). This book and the associated geographic theory material focus on the world of shipping post-1945 and on the geographic and economic motivations and relationships that contribute to port development. In this context ports are described as being within a port-urban interface. They lie within the liminal space between the water and the hinterlands. Ports typically

coexisted with the urban centers within the port-urban interface. Cities would provide good areas for safe harbors and trade opportunities, while the port would provide the city with a central location for commerce while also keeping the industry of the city in business (Hoyle and Hilling 1984:1-2).

The authors assert that a historical approach to port development might seem effective at conveying a continuous progression of events. However, economic patterns are not always stable and regional economies rise and fall. These events can be caused in part by the demands and stresses of larger activity and trade systems that might not be obvious to people of one specific region (Hoyle and Hilling 1984:6). For Hilling and Hoyle, technological, geographic, and spatial factors must be taken into consideration.

Technological Considerations

One of the larger concerns regarding the development of regional ports relates to spatial and geographic characteristics. The need to be able to house and manage the cargo vessels docked in the area is a cornerstone to the success of any port system. Over the course of the last half of the 20th century, the ability for regional ports to perform this basic function dramatically decreased. Prior to this development, in the early to mid-20th century, methods of cargo handling were simple, based on gangs of workers whose productivity was relatively low at 12-20 tons per gang hour. Due to this, many vessels typically spent between 50-80 percent of the time on voyages tied up in port. These low efficiency handling procedures, as well as natural limitations on many ports, kept the sizes of vessels stable at 5000-8000 tons for deep sea trades. However, by the 1950s and 1960s, these methods became obsolete as labor and port time costs increased (Hoyle and Hilling 1984:9).

The first innovation in cargo handling was the pallet, which improved the efficiency of ship-shore transfer of cargo. Standardized dimensions for cargo shortly followed, instead of measurement by worker-loads goods were measured by unit-loads. Standardized container characteristics as well as maximum weight for machinery handling was implemented. The standardization did not stop at the ship-shore transfer; these measures allowed freight to be shipped from origin to destination without the breaking of bulk. These methods were not only intended for the ship-shore transfer but also for the through journey from the origin to the destination (Hoyle and Hilling 1984:9-10).

The natural progression that this process took was the implementation of the International Organization for Standardization [ISO] container system in the 1960s. Thereafter, containerization spread rapidly and increased the size of vessels dramatically. The first generation of container ships were around 750 tons with a 180 meter (m) length and a 9m draft. The third generation of ships were around 3000 tons with a 275m length and a 12.5m draft. These vessels have only continued to increase in size. Containerization and the scale of these vessels dramatically increased efficiency with the downside of lower employment and only a small number of ports that can handle this type of trade. Container port labor forces could be reduced by as much as 90 percent, with an output that might be 10 times greater than productivity levels prior to the introduction of the container. Container ports are also space intensive. Traditional ports might need around 1 hectare (ha) of land per berth for storage while container ports need somewhere between 12-20 ha per berth of open-hard surface for efficient ship to trailer transfer. Gantry cranes provide increased productivity at a little less than 900 containers in a 24-hour period, so the port time spent by a vessel is greatly reduced all while ship sizes continue to increase (Hoyle and Hilling 1984:10-11).

Increases in ship sizes and productivity also led to a staggering concentration of trade. The high cost of constructing and equipping container terminals and the ship owner's desire to minimize ports of call led to this shift. This also marks a change in the hinterland-port dynamic. A small number of large container terminals with high-capacity inland transport links can now serve a much larger hinterland than was previously possible (Hoyle and Hilling 1984:11).

The shipping revolution dramatically shifted the port-hinterland relationship and put incredible amounts of stress on regional ports that had never handled that much cargo before. The distinction between small and large amounts of cargo was no longer divided between small and large ports. Because of centralized containerization, large ports handled almost all the shipping. Smaller ports were outcompeted economically and when they were not, their ability to adapt to the new technology was a function of their geographic characteristics. The efficiency of their connections between the sea and hinterland were of immense value. Many, however, did not have the kind of connection required to keep them running (Hoyle and Hilling, 1984:11).

Geographic and Spatial Considerations

There is a two-way interaction between a port and its hinterland. The development of a regional economy, initially, may well be a function of adequately provisioned port facilities. However, in the long term, it is the health and sustainability of hinterland trade that determines the fortune of a port. This connection is sustained by the inland transportation system that links the two. During the 19th century many ports were defined by their railroad connectivity. In ports without large, navigable waterways, railroads supplied the means of getting goods into and out of port. Railroads, however, are exceptionally good at transporting bulk goods in dense traffic flows. Essentially, they are great at transporting large amounts of goods, such as coal or iron ore,

over intermediate distances and without the need for transshipment. Heavy industrial development such as that seen at the turn of 20th century utilized this kind of transportation. However, the mass consumption stage of modern economic development does not necessarily require this kind of transportation. Road networks on the other hand, provide a high level of density, connectivity, and accessibility that railways cannot attain. This shift in hinterland connectivity caused a change in traditional port traffic. Some ports may lose their traffic while others might extend and increase connectivity to their hinterlands. These changes are marked by well-established, competitive inland transportation systems. Due to this, individual ports and their hinterland links are more likely to be exclusive and defined in terms of existing transportation links (Hoyle and Hilling 1984:7-9).

For ports with existing transportation methods such as railroads and roadways, there is another spatial factor that affected adaptation and progression. Traditionally, these transportation links would connect a port and its hinterland through the urban center of the city where the port was located. However, containers require an efficient interface between water and land transportation. Efficient and high-volume traffic, whether by railroad or roadway, cannot be sustained in the congested confines of modern urban waterfronts. It needs uncongested access to major inland transportation systems and market or distribution centers. In many cases neither the land nor transportation access required can be found in old port districts within urban areas. This necessitates the relocation of port facilities. Container trucks cannot maneuver in large centers such as Manhattan, just as they cannot maneuver in small town regional ports (Hayuth 1982:221).

This relocation creates another question – where exactly will facilities be relocated? Congested urban waterfronts, lack of port back up space, the high cost of land and labor near a

port, and new strategies of cargo distribution allow for the creation of inland container depots that are tens or sometimes hundreds of miles away from the shoreline. Some are located as far from the West Coast as Utah and Montana. These inland facilities have taken on many of the traditional port functions as well such as cargo consolidation, customs clearing, forwarding, container marshalling, packing, and container repair. Other non-maritime innovations have greatly affected urban ports. Commercial aviation has essentially eliminated passenger liners which in turn severely reduced the use of passenger terminals. The decentralization of manufacturing to the outskirts of cities or away from metropolitan areas necessitated a modification to traditional port locations. The geographic proximity of a city and port, which was once an advantage, has now become a detriment and stunts port development (Hayuth 1982:221).

The Geographic-Spatial approach can be used in conjunction with the historical perspective on port development. This approach focuses on the geographic, spatial, and economic factors that have led to the rapid revolution in waterborne cargo transportation. The Historical-Geographic approach takes both theoretical perspectives and combines them into a holistic theory that describes historical factors as well as geographic and economic factors that lead to port development around the globe, including regional ports such as Washington, North Carolina.

Historical-Geographic Approach

A final perspective, a Historical-Geographic approach is laid out by port historians Tapio Bergholm, Lewis R. Fischer, and M. Elizabeth Tonizzi in their (2004) book, *Making Global and Local Connections: Historical Perspectives on Ports.* They describe ports as being focal nodes

between competitive global maritime commerce while being tightly connected to local political, social, industrial, and transport networks. Due to this, ports lie at a crossroads between international, national, and local historiography. If historians are to understand the links between ports, their history, and the wider world, they need to be investigated within this holistic view (Bergholm et al. 2004:vii).

An example of the intersection of all these factors is found in the evolution of northern Chilean ports during the late 19th through the 20th centuries. These ports initially expanded based on the exploitation of mineral resources and raw materials that are found in that region of Chile. The mountainous geography and topology of that region necessitated transportation of commerce over water rather than land. The commercial development combined with the rough terrain made the use of waterborne transportation preferrable to that of overland travel. These two factors led to the initial creation of ports in the region (Badia-Miro 2004:153).

The development of these ports was initially a function of the local geography; however, historical trends and economic forces played their part in developing northern Chilean ports. The 1904 commercial output shows that bigger ports such as Antofagasta and Iquique provided larger entrances for vessels and were the center of trade for foodstuffs and manufactured goods while many smaller ports such as Togai were only focused on extracting and shipping raw materials such as nitrates. Due to the smaller ports' lack of diversity, they were prone to disturbances from shifts in the global market. The 1920s marked a period of readjustment for the ports caused by World War I, however, their recovery was relatively weak due to the invention and increasing demand for synthetic fertilizers. This weak recovery was stunted further by the Great Depression in 1929, which saw demand for nitrates decrease even further. By the 1930s

half of the 28 ports that were operating at the beginning of the century had disappeared (Badia-Miro 2004:154-159).

From the 1930s to the 1970s, the remaining ports shifted their priorities based on global demand and domestic policies that heavily favored industrialized processes. The previously important nitrate mining ports were superseded by ports that specialized in the handling of copper exportation due to copper's increasing demand on the global market. Larger entrance ports began a process of increased centralization in the port system that brought about the production of manufactured and semi manufactured goods. The ports which specialized in the export of foodstuffs also adjusted to these changes and began to provide more food shipments to the larger manufacturing ports in the north. This period of northern Chile's port development was characterized by the modernization of many production methods and the import of machinery, as well as an increase in jobs in the manufacturing sector (Badia-Miro 2004:160-167).

The period from the 1970s on saw some other changes to the port system structure. A process of deindustrialization caused some manufacturing jobs to disappear and a subsequent dispersion of the population to more rural based industries such as fishing and agriculture. The copper industry, however, remained a key part of the economy and due to the capital-intensive nature of the extraction process, copper ports remained large population centers. The machinery and tools required for copper extraction also required the ports to adapt to the needs of the industry. The copper mining ports became a more integrated and sustainable system during this period. Despite ongoing deindustrialization, the larger ports still cemented themselves as the manufacturing centers of the region. The smaller, specialized agriculture and fishing ports that still survived provided the foodstuffs for the more centralized mining and manufacturing regions

(Badia-Miro 2004:164-169). Industries such as nitrates that led the Chilean economy at the beginning of the 20th century were phased out due to global market demands. The ports that supplied and exported those raw materials were so specialized for that one industry it was impossible for them to adapt, and they eventually died out. Ports then began to grow around regions with still viable economic opportunities such as those centered around copper mines or manufacturing centers. Populations grew as the jobs and money in those areas began to increase. The more decentralized, smaller ports that were still around were focused on agriculture and they subsequently were able to provide food for the larger, centralized areas (Badia-Miro 2004:169).

The historical-geographic approach connects many factors with the development of ports including the larger historical trends that shaped the global economy and markets. The foreign and domestic developments that shaped the port system were also considered. The geographic location of the ports is also of primary importance as that determines its proximity to the wider markets and also helps to define its specific role in those markets. Overall, the historical-geographic approach holistically takes in and analyzes as many as possible of the factors that affect the development of a port. Washington, North Carolina, like the ports of northern Chile, developed and evolved due to these same factors, which will be assessed later in this thesis.

Conclusion

The Historical-Morphological, Geographic-Spatial, and Historical-Geographic approaches to port development describe the ways in which ports and the systems that support them change and adapt over time. Historical trends in all manner of life from economics to domestic and foreign policies help dictate which industries become more viable as time progresses. Geographic considerations are of utmost importance when considering areas

associated with port survival and failure. Each of these theoretical approaches can be applied to Washington, North Carolina. The morphological changes that Jackson (1983) describes goes hand in hand with Hoyle and Hilling's (1984) assertions regarding the geography and spatial relationship of a port which both play into historical and geographic context, as argued by Historical-Spatial theory proponents.

CHAPTER 3: HISTORY OF WASHINGTON, NORTH CAROLINA'S WATERFRONT INDUSTRY

Introduction

Washington North Carolina is a small town located on the coast of North Carolina. It once had a bustling industrial waterfront (Figure 2) with thriving trade but over the last century the industry vanished, and a recreational waterfront replaced it. This chapter outlines the history of Washington from its formation to its period of expansion and modernization. It then describes the time through the period of industrial contraction and economic decline to 1973 when the recreational waterfront was created. This is intended to provide a background and historical context of the town which is used later in this thesis to analyze the reasons for its industrial decline.

To understand how this process occurred, it is necessary to break up the history into distinct periods. The Geography and Early History section will give a general background into Washington's waterfront history through the Civil War. The Modernization and Expansion section is the history of the waterfront during its height of prosperity from the reconstruction period through the beginning of the First World War. Contraction and Decline highlight the period between the ending of the First World War through the completion of the waterfront revitalization project that took place in 1973. The division of the waterfront's history into distinct phases is necessary to fully understand why and how Washington's waterfront went from an industrial high during the turn of the century to complete demolition in relatively short time.

FIGURE 2: Historic Washington waterfront circa 1900 (Courtesy of the Historic Port of Washington Project).

Geography and Early History

Washington was founded in 1776 by James Bonner. Situated on the north side of the Tar River at the opening of the Pamlico Sound, it quickly became an important hub of activity for eastern North Carolina. During the American Revolution, the town became a center for privateer activity as vessels being outfitted there plied the Atlantic to hunt British shipping. At the end of the revolution the town shifted into a more conventional, commercial role. By the 1780s, large wharves had been constructed with the ability to berth around twenty trading vessels. Tobacco, turpentine, tar, pitch, rosin, furs, boards, shingles, among other regional goods, were regularly shipped to the West Indies and other states along the east coast. By 1800, mercantile houses had been established by the Blount firm, with the Fowle brothers arriving shortly afterwards. This variety of trade combined with large business interests to set the stage for the next half century of Washington's prosperous maritime trade (Paschal 1976:1-5).

This booming trade is exemplified by the 130 vessels that entered Washington's port in 1796 alone. In 1812 a substantial bridge across the Pamlico was constructed with funding and

lumber provided by Washington and its residents, marking a major improvement to the town's infrastructure. The Fowle brothers also arrived in Washington in 1812 and by 1818 they had established a shipbuilding company on Castle Island. Tannyhill and Lavender founded the first sawmill around this time, which helped supply the blossoming shipbuilding industry (Worthy 1976:11). The turpentine and tar industries quickly expanded in the early 19th century as well. Many distilleries were constructed on the south side of the Tar River just opposite of Washington, due to the fire hazard the production of turpentine posed (Nassif 2019:20-21). By 1830 the population had doubled to over in 10,000 people in Beaufort County, indicating the economic success of Washington, though many did not live in the town itself. Washington experienced explosive growth in all metrics during the first half century of its existence. Expanding population and trade allowed the town to become one of the up-and-coming cities in North Carolina (Worthy 1976:10-11).

One major factor in Washington's growth during this period was the lack of overland transportation routes. The geography of eastern North Carolina made overland travel difficult. Dense pine forests and swampy land prevented the creation of large-scale road networks. The Old Post Road was the only serviceable thoroughfare that ran from Edenton to New Bern and Wilmington. The road brought some carriage trade but could not meet the demand as the waterfront. Railroads had not been extended to the coast by this time either, which left waterborne transportation as the only efficient means of travel and trade (Van Camp 2000:7).

Through the 1830s, the shipbuilding industry expanded due to increasing demand for merchant shipping. This growth led to waterfront innovations which were highly useful and publicized. Captain Hezikiah Farrow during this time built the first marine railway for hauling ships out of the water for repairs. The railway operated with success and construction of other

marine railways appeared soon after. The railroads, however, were not the only innovation on the waterfront. Steamships were introduced in 1831 through the construction of the steamer *Edmund McNair* by Lavender and Tannyhill. Such ships could easily ply the shallow and hazardous waters of the upper Tar River and began to supplant sailing vessels as the primary method of waterborne transportation (Nassif 2019:19,23). *Edmund McNair* was specifically built for traversing the shallow waters and regularly shuttled barrels of raw turpentine to Lavender and Tannyhill's distilleries across from Washington (Cox 1989:45).

Commerce on the Tar River increased over the following decades, and Washington continued to expand with the growth of the turpentine and lumber industries. Shipbuilding also continued as a staple of Washington's economy; the 1850 census listed twenty-three practicing shipwrights in Beaufort County. The industry peaked in 1855-1856, however, with the panic of 1857 dropping ship production by seventeen percent. Adding to that misfortune, the negative effects of the Civil War ruined Washington, and stunted the growth that it had seen during the preceding century (Cox 1989:46).

A Confederate garrison held the town at the outset of hostilities, however on March 14, 1862, the Union defeated Confederate forces at the Battle of New Bern. This Union victory forced Confederate armies in the area, including Washington's garrison, to withdraw. On March 20, 1862, Union forces sailed from New Bern to Washington and although they were briefly stopped by a blockade, they pushed through and occupied Washington that day. Confederates launched a concerted assault against the entrenched Union forces in September of 1862, however, the attack failed. Both sides then settled in for a siege that lasted through 1863. However, a dynamic strategic situation necessitated a Union withdraw in April 1864. Soldiers ransacked the town for three days and while leaving on April 30, they set fire to the town

(Warren 1976:36, 44-45). The fire spread rapidly and destroyed most of the buildings on the waterfront as well as the bridge that connected Washington to the south shore landing (McIntre 1976:50). The town was utterly devastated from the war. Around one third of the buildings were destroyed in the fighting and the fire. Scarcely five hundred residents remained out of a prewar population of around thirty-five hundred. The war, although disastrous, did not hamper Washington's ability to recover its former position as the central trading hub on the lower Tar River (Warren 1976:45).

Modernization and Expansion

The period of Modernization and Expansion has two distinct phases. The first is of a rapid recovery following the destruction wrought by the Civil War. The second is that of continued economic growth following reconstruction which saw the peak of Washington's Waterfront commerce.

Recovery and Rise to Prominence: 1875-1900

The town slowly recovered during the reconstruction period. The main draw for outside investment was the vast and rich pine forests around Washington. The Jamesville and Washington Lumber Company was incorporated in 1869 and soon acquired 39,680 acres of pine forest between Washington and Jamesville. In 1877 the company constructed Washington's first terrestrial railroad which was a low gauge track that ran down Washington Street and provided transportation from the lumber yards to the port (Moore 1976:66).

Industrial expansion in Washington was helped not only by terrestrial transportation improvements, but waterway improvements as well. Between 1876 and 1887 the federal

government spent $56,000 on dredging and opening about 60 miles of the Tar and Pamlico Rivers. This reduced shipping costs by 12 to 25 percent. It also increased commerce by $1,800,000 annually. This relatively small investment by the government paid large dividends. Commerce and the population continued to increase and in 1886 Washington was recorded as having a population of roughly 2,500 people (*Wilmington Messenger* 1887). By 1891 commerce in the port of Washington reached, adjusted to 2022 dollars, $148,297,846.15 annually, compared to $13,137,757.01 annually in 1876. The town flourished due to the trade provided by the centrality and upkeep of the port. The clearing of the debris filled Tar River helped immensely with this return to success that Washington experienced after the period of reconstruction (Hill 1984:9).

The dredging and clearing of the Tar River combined with the capital investment in the industries of Washington paid dividends during this period. Trade from all around the East Coast and the West Indies was booming. A *Morning Star* excerpt from December 4, 1874, states, "Baltimore and New York steamers now touch at Washington, North Carolina, for produce." (*The Morning Star* 1874). Washington had a set of regular West Indies traders around this time. The *Wilmington Star* in 1878 stated, "The port of Washington now has three fine schooners engaged regularly in the West Indies trade, besides others that make occasional trips" (*Wilmington Star* 1878). By this time, the composition of trade flowing out of Washington had changed. According to Mr. T.H.B Myers in 1884, "Prior to 1860 exports were mainly of naval stores, corn and cut lumber and after the war cotton and rice took the place of corn and cut lumber and shingles took the place of naval stores" (Litchfield 1976:233).

By 1891, Washington took on an entirely different look than a town that was recently ravaged by war. *The Weekly Star* reported on February 27, 1891:

> This place [Washington] has improved very much in the last two or three years. A great many wooden structures have been replaced with handsome two- and three-story brick buildings. The several industries of the town have increased its shipping trade very much. The oyster canning factories are doing a thrifty business; also, the merchants. The steamers plying between Tarboro and this place are doing a heavy business, also in freighting and passenger traffic (*The Weekly Star* 1891).

Along with the regular manufacturing industries, fishing was also going extraordinarily well. In 1881, *The Morning Star* of Wilmington, North Carolina reported that the most successful fisherman on the Pamlico was Dr. Bryan who shipped over $10,000 worth of Shad, Rock, and Perch fish to northern markets (*The Morning Star* 1881). In two instances in 1888 and 1890, the *Washington Gazette* mentioned that the number of vessels on their wharves makes the town take on a "business like aspect" (*Wilmington Star* 1888; *Weekly Star* 1890). In all respects the town grew at an astonishing rate and for good reason. As the industries of the area boomed, commerce flowed out of Washington up and down the eastern seaboard. The trade coming into the Pamlico and Tar required a stop at Washington before proceeding upriver. The strategic position that made it an important target during the Civil War contributed to its rapid advance as a mercantile center of the region. The improvements and clearing of the channel helped open these opportunities for Washington and allowed trade to thrive (Hill 1984:9).

Large manufacturers lined the waterfront during this period. This included the Old Dominion Steamship company, Farrows Shipyard, the J.S. Farren & Company Oyster Packers,

Pamlico Iron Works, Phillips Fertilizer Company, and several lumber plants and sawmills including the largest, the Kugler Lumber Company (Hill 1984:10). These large industrial waterfront plants were supplemented by many smaller businesses as well. Wholesalers and retailers of various products on First Street accompanied the industries on the waterfront. By 1890 multiple lumber mills and the railroads that supplied them sprang up across the town and included: Pamlico Cooperage Co., Havens Mill, Moss Planning Mill Co., Fowle Mill, E.M. Short Lumber Co., and Eureka Lumber Co. (Van Camp 2000:7).

While the economic growth of Washington was rapid, the population still had to contend with natural disasters which sometimes had a devastating impact on the town. In 1877 heavy rain caused the river the flood which destroyed bridges, dams, and some mills along the Tar River and its tributaries (*Wilmington Star* 1877). Fires of various magnitudes also plagued the small town. In 1881 a large steam sawmill owned by Mr. Worden of Beaufort County burned down only a few miles from Washington (*Wilmington Star* 1881). In 1896 a large fire started at a wooden icehouse on the waterfront. It spread to the surrounding wooden structures, shipping sheds, and lumber yards, it took the entire police and fire department as well as a rainstorm to quench the flames only after it caused $30,000 in damage (*Wilmington Messenger* 1896). However, these events were only relatively minor setbacks for Washington and by the end of the century it had grown to great proportions. By the late 1890s the town was bustling. Railroads brought lumber to the mills where it was processed, loaded onto waterborne transportation, and shipped to its destination. The population rebounded as well; the census of 1900 recorded the town's population as 4,842. This shows significant growth from the post-Civil War population of little more than five hundred people (Moore 1976:71).

Height of Prosperity: 1900-1914

Even though this was arguably the most prosperous time in Washington's history, it began with a catastrophe. A devastating fire that broke out on September 13, 1900 proved impossible to control. It started at either the J.S. Farren oyster cannery building or the Brabble Eating Saloon on Water Street. The flames could not be stopped, and the fire burned all the buildings on Water, Market, and Main Streets. Even though it did not seem like it at the time, the fire proved to be a blessing in disguise. Many of the structures that were burnt were nothing more than wooden shacks with shoddily built and often injurious plank sidewalks. The fire cleared this area for future construction and new city ordinances required new buildings to be constructed of brick rather than wood and the detrimental wooden sidewalks did not return (Moore 1976:71-72).

This was an inflection point for Washington, its prosperity brought further industrial investment but also innovations in methods of transportation. Railroads, invented in the early 19th century, rapidly expanded throughout the United States. In this early period of technological development, the hard to access interior of eastern North Carolina prevented expansion of the railroad into these areas. However, as the century ended, the geographic limitations that forced Washington to use mainly waterborne trade were slowly conquered. Following the introduction of the railroads in the 1870s, tracks that connected Washington to the larger eastern seaboard trade routes appeared. In 1904 the Atlantic Coast Railroad built a warehouse, a depot, and a boat landing on Gladden Street. The Washington and Vandermere railroad arrived in 1905 and serviced the Eureka Lumber Mill. The Norfolk and Southern Railroad Line laid tracks down as well and constructed a swing bridge between the north and south sides of the Pamlico in 1909 (Van Camp 2000:7).

Even before the early 20th century expansion, railroads played an important part in Washington's economy. In 1880 it was reported that Washington had a weekly steamship line that went through Hyde County and the villages on the south side of the river (*Wilmington Star* 1880). In 1896, however, the steamer *Aurora,* was under the ownership of one of the railroads which removed it from the Hyde County, south shore village line schedule (*Wilmington Messenger* 1896). While these excerpts do not provide context for this move to discontinue that line of trade, the railroads controlled their rail lines and steamers on the river. They also had the power to discontinue service, possibly impacting Washington's waterborne commerce. The railroads not only provided a different route of transportation but also a significant portion of the investments that went into developing Washington's infrastructure. In 1893 the Atlantic Coast Line was investing in a grain elevator and a water depot as well as two fast steamers that would run in conjunction with their rail lines down the river (*Wilmington Messenger* 1893). While this relationship was mutually beneficial during this time, by the early 20th century the railroads would begin to supplant waterfront commerce as the primary method of transportation.

Despite this inevitability, Washington continued to thrive in the first decade of the 20th century. By 1911 Washington had doubled in size to a population of roughly 10,000. Waterfront trade was sizeable, barges imported coal, fertilizer, merchandise, salt, cement, and hardware, while exporting lumber, shingles, cotton, and agricultural products (Hill 1986:11). One industry that the railroads could not access was that of oyster harvesting. The harvesting of oysters in the Pamlico did not become important until 1889 when the Chesapeake was overharvested, and those oyster fishers moved down to North Carolina to new grounds. However, the practice of non-North Carolinians harvesting oysters ended when the governor prohibited nonresidents from the practice. Oystering became more and more lucrative over the next decade and production peaked in 1902

with the harvesting of over 5.5 million pounds of oysters. However, by 1918 the yield had decreased to only a fraction of that number due to over-dredging and the failure of oyster culturing in the Pamlico. Through this brief but euphoric time, railroads and steamers worked side by side to transport trade goods and the oyster industry was reaching its peak. This honeymoon period of expansion, however, would not last. World events outside of Washington's control as well as some that were in Washington's control caused the demise of the town's waterfront commerce industry (Kramer 1996:6-9).

Contraction and Decline

Washington's period of Contraction and Decline has two distinct phases. A period of steady economic decline followed the prosperous first decade of the 20th century. Global, regional, and technological factors precipitated this decrease in commerce. The second phase of waterfront transformation saw the final vestiges of the industrial waterfront remade into a recreational and tourist-oriented waterfront.

Steady Decline: 1914-1945

This rapid increase in maritime and terrestrial industry caused some growing pains for Washington by the end of the 1910s. Even though the past couple of decades had seen the maritime and railroad industries grow side by side, railroads began to outcompete their commercial neighbors. While this was a gradual process, waterborne trade was slowly becoming unprofitable and impractical (Litchfield 1976:234). While this occurred, the waterfront overcompensated by creating many new piers. During this time, the wharf of the waterfront was built up to such an extent that there was little room for further growth. The number of piers continued to expand

between 1911 and 1918. A United States Army Corps of Engineers report from 1918 stated that there were fifty piers in Washington and the main business portion of town, between the bridge and Kuglar Lumber Company, was "badly congested with little opportunity for terminal development" (United States Army Corps of Engineers [USACE] 1918:590-591). Creating new piers to keep up with demand can be a successful business move, however, building the amount that creates congestion only serves to stifle the appeal of the port. The congestion of the area as well as the introduction of the railroads contributed to the decreased rate of waterborne transportation of goods. This is especially apparent by comments in some of USACE reports. For instance, in 1918 it was stated that "The decrease in timber was due to the fact that at many water points it has already been cut and mill men are compelled to get more of their timber by rail (USACE 1918:591). Though steamboats continued to move and trade upriver, the railroads and eventually automobiles combined with the creation of road systems, to degrade the supremacy of Washington's waterborne trade. While the waterfront industries declined, the shipbuilding industry suffered the same fate (Nassif 2019:35).

Shipbuilding, which once played a large part in the income of the town, began to wane. This was mainly due to the changing times, shifting methods of construction, and demand for different types of vessels. Washington was geared toward the construction of wooden ships. Once the Civil War ended and the transportation revolution began, there was increasingly lower demand for wooden hulled ships. Though repairs and hauling of vessels remained profitable, the number of ships built vastly decreased with the drop in demand coupled with the cessation of the lucrative West Indies trade at the turn of the century. However, shipbuilding did struggle on in Washington through the decades. In the 1940s a small fleet of shrimp fishing boats was constructed for use in the Gulf of Mexico. During World War II the Gehagen Construction

Company built thirty oil barges, using a previously inactive shipyard (Hill 1984:12). Even with these sporadic orders for ships, an industry which was once a staple of the town's economy all but vanished. There was little demand for the vessels that Washington could provide. The size of the town and the lack of any real financial support prevented it from pivoting to other methods of ship construction (Loy and Worthy 1976:127).

The Great Depression ended the happy decade of the roaring twenties and Washington was affected as badly as other towns across the United States. Out of the three banks in the town, two closed, and all the customers who used to shop at main street disappeared (Squires 1976:128). The thirties were a bad decade for the country and for Washington. Though the United States was recovering by the late 1930s and early 1940s, the damage to Washington had largely been done. By the 1940s most of the lumber mills of the area had closed (Van Camp 2000:8). Young men also volunteered or were drafted for World War II and the town even faced a shortage of teachers along with the many young men who enlisted in the armed forces who otherwise might have sought manufacturing jobs (Glover and Jones 1976:151). Manufacturing in Washington was not the only industry in the area that declined either. The oyster industry sharply decreased in productivity. From its peak production of over 5 million pounds of oysters in 1902, the following years showed declining numbers – only six years later around 4 million pounds were harvested. By the 1920s and early 1930s only around 1 million pounds were being harvested annually. In 1940 the numbers hit an all-time low at just under 700,000 pounds. This steady decline may have been due to many factors, however, the production or the demand, or both for Pamlico oysters declined and this undoubtedly adversely effected the economy of Washington (Kramer 1996:9).

Waterfront Transformation: 1945-1973

When the war ended in 1945, the closing of lumber mills and businesses continued. In 1956 the Eureka Lumber Mill, one of the largest of the town was bought, sold, and sat idle until 1975 when most of the machinery was removed (Van Camp 2000:20). Advances in shipping and cargo transportation that developed during and right after the war essentially made regional small ports such as Washington obsolete. The invention of the forklift in 1950 led to the creation of wooden pallets that could hold multiple boxes or barrels of goods. This contrasts with the age-old method of having longshoremen haul cargo out by hand. Even though this invention on the surface seemed like a boon to small ports due to the increase of efficiency, it called for their immediate restructuring. Paved, concrete quays were required for the successful transfer of goods using a forklift. The warehouses as well needed improvement to accommodate for the heights that forklifts could reach. This meant that the usual low-level ceilings of warehouses needed to be raised to increase the storage space (Jackson 1983:151-153). Many small ports such as Washington had mostly wooden and uneven quays as well as low vaulted warehouses and might not have been able to accommodate new equipment. This innovation, however, could be worked around and solutions figured out if given the time and funding. Containerization developed in the 1950s, however, could not be stopped and was the final nail on the coffin of the old port system. It became apparent to port authorities that to increase trade volume, the containerization that began to develop in the Second World War needed to be adopted. The old port systems were generally too worn out and small to accommodate this last piece of the shipping revolution (Jackson 1983:152-155). As the world moved closer to the present day where containers are the main method of seaborne transportation, small ports like Washington no longer served a commercial purpose.

The decline in the town's main industries caused a diversification of the economy during this time as well. A 1966 report stated that small industries such as a shirt manufacturer, yarn mill, and furniture plant, as well as various regional products such as yarn, meat, flour, fertilizer, feed, lumber, and insecticides, were produced in Washington. This diversification in industry, however, did nothing to prevent the eventual demise of the waterfront. Despite improvements that were made throughout the decades, the city was susceptible to storm surges due to the low seawall. In the early 1970s around 45 acres of the waterfront generally west of market street were demolished and filled and on it, Stewart Parkway was created. The area was cleared of abandoned warehouses, pier pilings, and dilapidated buildings were removed, a 1900-foot steel bulkhead was created and sand from the river was pumped in to complete the project (Hill 1984:13-14). The Old Colonial Ice Co. and the old mill behind the Louise Hotel were removed, while Pamlico Chemical Co., Atlantic Seaboard Railroad, and Gerard's Piston and Ring Company all found new locations; the project was completed in 1973 (Cochran 1976:515). While the seawall provides a location for local pleasure craft to dock, the historic industrial waterfront has all but vanished, and may only be seen through sub surface and sonar surveys of the filled in land.

Conclusion

The port town of Washington, North Carolina was an integral facet of the regional trading network from its inception through the 20th century. The expansive pine forests of eastern North Carolina provided vast lumber supplies and the agricultural sector provided products such as corn and cotton. The swampy and low-lying geography of the region necessitated waterborne transportation. However, by the turn of the 20th century, the monopoly that waterborne trade had

on commerce was slowly withering away. Innovations in transportation like the railroad and automobiles outcompeted the waterfront and eventually made the waterborne trade obsolete. By the mid-20th century there was little to no waterfront industry to speak of, and the warehouses, wharves, and piers sat derelict. In 1973 the town decided to pivot away from the rotting industrial area, filled in the old piers, and created a roughly 45-acre area known as Stewart Parkway as well as restaurants and tourist attractions now sit. Local pleasure craft now ply the waters around Washington rather than the fleets of trading vessels of days past.

CHAPTER 4: METHODOLOGY

Introduction

This chapter will discuss the process of creating a 3D reconstruction of Washington's waterfront. It provides a discussion of the overall workflow, technical and conceptual issues, and efforts to ensure quality control. Furthermore, it gives an outline to the practical foundation in which this thesis uses to frame the research. The historic port of Washington has undergone immense changes since the end of the Civil War. Historical data collection, waterfront surveys, and 3D reconstructions can help archaeologists and historians recreate the once bustling commercial hub of the Tar-Pamlico Region. However, these facts must be presented in a comprehensive and cohesive manner to be accurately analyzed. To correctly frame this historical data, however, extensive research was also conducted to place the evolution of Washington's waterfront within the bounds of the geographic, economic, and historic port development.

Historical research was the primary method for collecting data on the historic waterfront. Secondary sources were integral during the initial stages of research to gather data and obtain a general historical context in which Washington grew and declined. Many of these sources, however, failed to satisfactorily describe the driving forces behind the expansion and dissolution of commerce on the waterfront. Primary sources were then used to fill in the gaps left by secondary historical sources. Included in this is analysis of commercial and economic data pertaining to Washington and the Pamlico River between the years 1876 and 1972. This provides a solid foundation of raw data that is analyzed in conjunction with the 3D reconstruction of the town.

The waterfront's commercial success and decline is tracked through historical data and visualized using nine Sanborn fire insurance maps made between 1885 and 1943. These maps were combined into composite images and imported into Rhino 7 to create a 3D reconstruction of the waterfront over time. The historical data and visualization combine to provide a holistic view of the changes to Washington's waterfront at the end of the 19th and beginning of the 20th century. Archaeological data in the form of side scan sonar imagery of the current waterfront is used in this process as well. This data increases the accuracy of the reconstruction and confirms the location of historical structures that appear on the Sanborn Maps. The methodology described in this chapter allows for a multi-dimensional approach for the historical study of ports. Imbuing historical data into a 3D visualization of Washington's evolution allows for a data driven and accurate analysis of the process and has the potential for application to wider studies.

Theoretical Foundation

As mentioned in Chapter 2, to create a suitable framework for this research, varying theories on the development of ports were consulted. The differing theories of port development fall into three distinct categories: Historical and Morphological; Geographic and Spatial; and Historical and Geographic. The first two theorical approaches are vastly different from one another and either use mainly historical data or geographic data to analyze the development of ports. The third theory, however, uses a combination of both these approaches in an attempt to create a more unified and holistic approach to evaluate the evolution of ports.

The historical approach was mainly conveyed through the work of Gordan Jackson in his book *The History and Archaeology of Ports* (1983). This book describes the evolution of British ports through multiple eras from the 16th century through the present day. While spatial and

economic descriptions of areas and production is present, the main argument lies with larger historical trends and how ports either managed or fell victim to those trends. Even though Jackson's book describes British ports, the parallels to American ports, especially during the late 19th and early 20th century, are apparent. This theoretical approach provides an overview of the larger historical forces that help to frame the rest of this thesis.

The second theoretical approach focuses on the geographic position of a port system, its connectivity to the hinterland through various methods of transportation, and its relationship to the wider regional, national, and international economies. This approach is primarily argued through the work of geographers B.S. Hoyle and D. Hilling in their book *Seaport Systems and Spatial Change: Technology, Industry, and Development Strategies* (1984). This theoretical argument forms the foundation for framing Washington's port within the economic and commercial region of the Pamlico Sound, as well as the wider Mid-Atlantic region. .

The final theoretical perspective explored in this thesis is the Historical Geographic approach. Editors Tapio Bergholm, Lewis R. Fischer, and M. Elisabeth Tonizzi's exemplify this in their book *Making Global and Local Connections: Historical Perspectives on Ports* (2007). This argument combines the previous two approaches into a holistic theory that connects historical economic and commercial statistics to provide an overarching analysis of port systems and the processes that propelled their development. This theoretical approach will be an integral facet in the framework of the analysis of the historical data as well as the 3D modelling component of this thesis. To analyze all aspects of the commercial and historic data for Washington, its waterfront needs to be connected to the wider system of change that are happening in the world at those specific times.

All of the theoretical perspectives discussed help to frame the arguments and assertions made later in this thesis. They tie Washington's industrial waterfront to economic and technological developments happening in the hinterland to the changes in waterfront trade. This is the framework in which the analysis of the data will take place.

Historical Data Collection

The first component of creating an accurate reconstruction of the port of Washington is the gathering of historical data. This process took the form of multiple steps. To gather general background information on Washington and the surrounding region during the past two centuries, secondary historical texts were consulted. Primary source historical data was also consulted to ascertain specific social and economic data points on Washington's development. These two main sources of data will then be used later to analyze the evolution of Washington's industrial waterfront.

Secondary Sources

Secondary historical sources were critical in the beginning phases of research which provided background information on Washington's position within the Pamlico region's larger history. The primary work consulted for Washington's history is Pauline Worthy and Ursula Loy's edited book *Washington and the Pamlico* (1976). This is a collection of essays written on different periods of Washington's history from its founding up through the 1970s. Louis Van Camp's book *Washington, North Carolina* (2000) was used for more historical knowledge as well as a source for historical photographs.

Many theses originating from East Carolina University were also studied for general economic data of Washington. James Cox's "The Pamlico-Tar River and Its Role in the Development of Eastern North Carolina" (1989), Alicia Kramer's "The Pamlico Oyster, Crab, and Shrimp Industries: Early 20th Century" (1996), and Christopher McCabe's "The Development and Decline of Tar-Pamlico River Maritime Commerce and Its Impact upon Regional Settlement Patterns" (2007) were particularly useful in gathering data related to the commercial trends of Washington. Will Nassif's "Reconstructing the Waterfront: An Historical and Archaeological Reconstruction of the Nineteenth Century Port of Washington, NC" (2020) was integral to the creation of this thesis and many economic trends that were discovered in his thesis are used as a foundation and will be expanded on in this thesis.

Other documents such as Michael Hill's "Historical Research Report: The Waterfront Area of Washington, North Carolina" (1984) proved vital for specific knowledge on the history of Washington's waterfront. Books, theses, historical reports, and newspaper articles were all used to gain knowledge on the processes and function of Washington's waterfront. However, exact historical data, particularly the economic and commercial history of the waterfront, was determined through consultation of primary source documents.

Primary Sources

While secondary sources provided background historical and economic data, the investigation of primary source documents was necessary to gain an in depth understanding of the economic system of Washington's industrial waterfront. Copies of articles written for newspapers from the 1880s to 1910s, such as *The Morning Star, The Wilmington Messenger, The Wilmington Star,* and *The Weekly Star*, were used extensively during the historical data

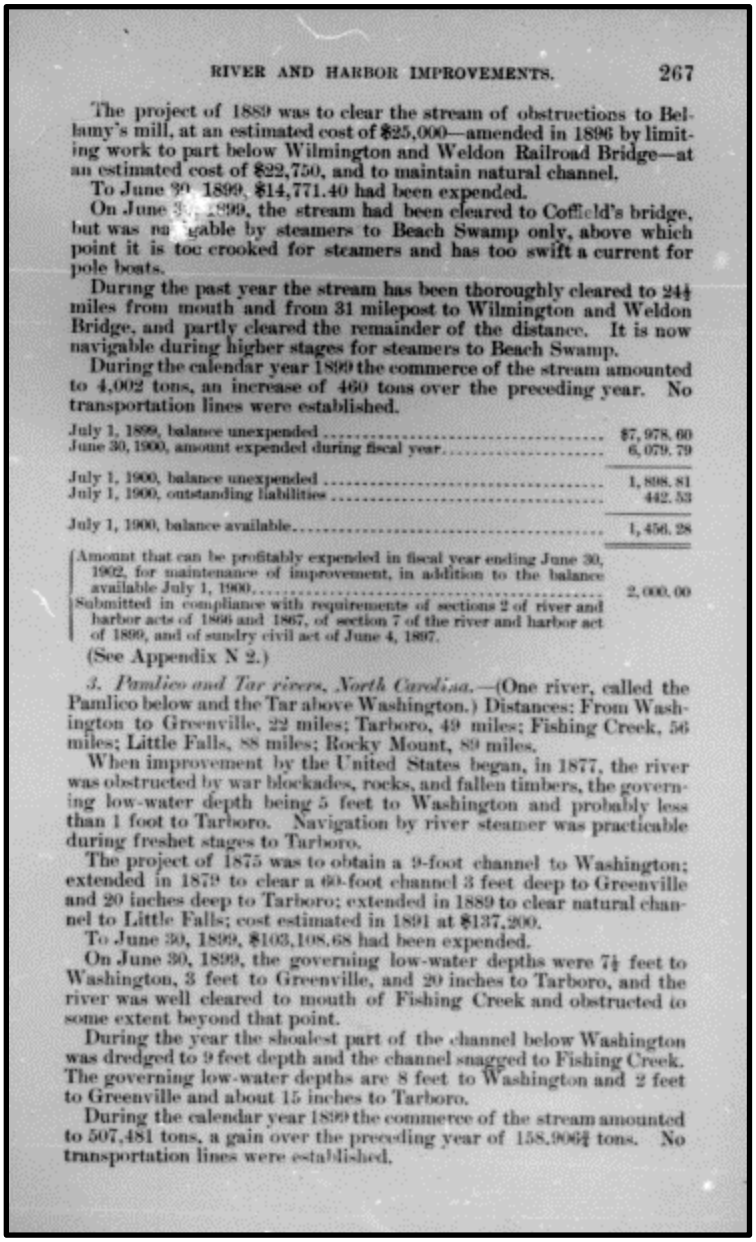
collection process. These articles provided a starting point for finding primary sources in which to gather more information. They also offer a glimpse into how Washington and its burgeoning industry was perceived by other towns in its vicinity. However, exact economic, commercial, and waterway maintenance data was provided by the USACE reports from the years of 1876 through 1972.

These reports are held in ECU's Program in Maritime Studies collections and searched for specific data on Washington. Stored on 16-millimeter film reels, these are organized annually and typically divided into multiple component parts. These reports include indexes and tables of content which made locating the necessary data considerably less troublesome than it may first appear. However, many times the table of contents left out page number information for Washington, necessitating the investigation of each individual component part.

The reports provided two main pieces of information including general information on Washington. The first type of information is data on dredging and clearing operations of the Tar and Pamlico River at Washington's waterfront. This data set also includes the cost of river improvement and maintenance as well as the estimated continued annual cost of the project. Amounts of material removed from the river and the overall state of the river and the project are also outlined in this section of the repot. The report gives an estimated timeline for the completion of the project as well as updates on the state of river improvement and maintenance. An example of this type of information is given below in Figure 3 which is from page 267 of the 1900 USACE Annual Report.

The second data set offered by these reports are detailed commercial statistics including itemized lists of import and export tonnage, location of shipment destination, and the number and types of vessels that came and went from Washington each year. An example of this type of

information from Page 5 of the 1900 USACE Report is given below in Figure 4. This data specifically will be crucial in the later stages of this thesis. Once the 3D reconstruction is complete, this information will be imbued into the model along with other methods mentioned below to give the reader a clear understanding of the transformation of Washington's waterfront.



RIVER AND HARBOR IMPROVEMENTS. 267

The project of 1889 was to clear the stream of obstructions to Bellamy's mill, at an estimated cost of $25,000—amended in 1896 by limiting work to part below Wilmington and Weldon Railroad Bridge—at an estimated cost of $22,750, and to maintain natural channel.

To June 30, 1899, $14,771.40 had been expended.

On June 30, 1899, the stream had been cleared to Coffield's bridge, but was navigable by steamers to Beach Swamp only, above which point it is too crooked for steamers and has too swift a current for pole boats.

During the past year the stream has been thoroughly cleared to 24½ miles from mouth and from 31 milepost to Wilmington and Weldon Bridge, and partly cleared the remainder of the distance. It is now navigable during higher stages for steamers to Beach Swamp.

During the calendar year 1899 the commerce of the stream amounted to 4,002 tons, an increase of 460 tons over the preceding year. No transportation lines were established.

July 1, 1899, balance unexpended	$7,978.60
June 30, 1900, amount expended during fiscal year	6,079.79
July 1, 1900, balance unexpended	1,898.81
July 1, 1900, outstanding liabilities	442.53
July 1, 1900, balance available	1,456.28
Amount that can be profitably expended in fiscal year ending June 30, 1902, for maintenance of improvement, in addition to the balance available July 1, 1900. Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867, of section 7 of the river and harbor act of 1899, and of sundry civil act of June 4, 1897.	2,000.00

(See Appendix N 2.)

3. Pamlico and Tar rivers, North Carolina.—(One river, called the Pamlico below and the Tar above Washington.) Distances: From Washington to Greenville, 22 miles; Tarboro, 49 miles; Fishing Creek, 56 miles; Little Falls, 88 miles; Rocky Mount, 89 miles.

When improvement by the United States began, in 1877, the river was obstructed by war blockades, rocks, and fallen timbers, the governing low-water depth being 5 feet to Washington and probably less than 1 foot to Tarboro. Navigation by river steamer was practicable during freshet stages to Tarboro.

The project of 1875 was to obtain a 9-foot channel to Washington; extended in 1879 to clear a 60-foot channel 3 feet deep to Greenville and 20 inches deep to Tarboro; extended in 1889 to clear natural channel to Little Falls; cost estimated in 1891 at $137,200.

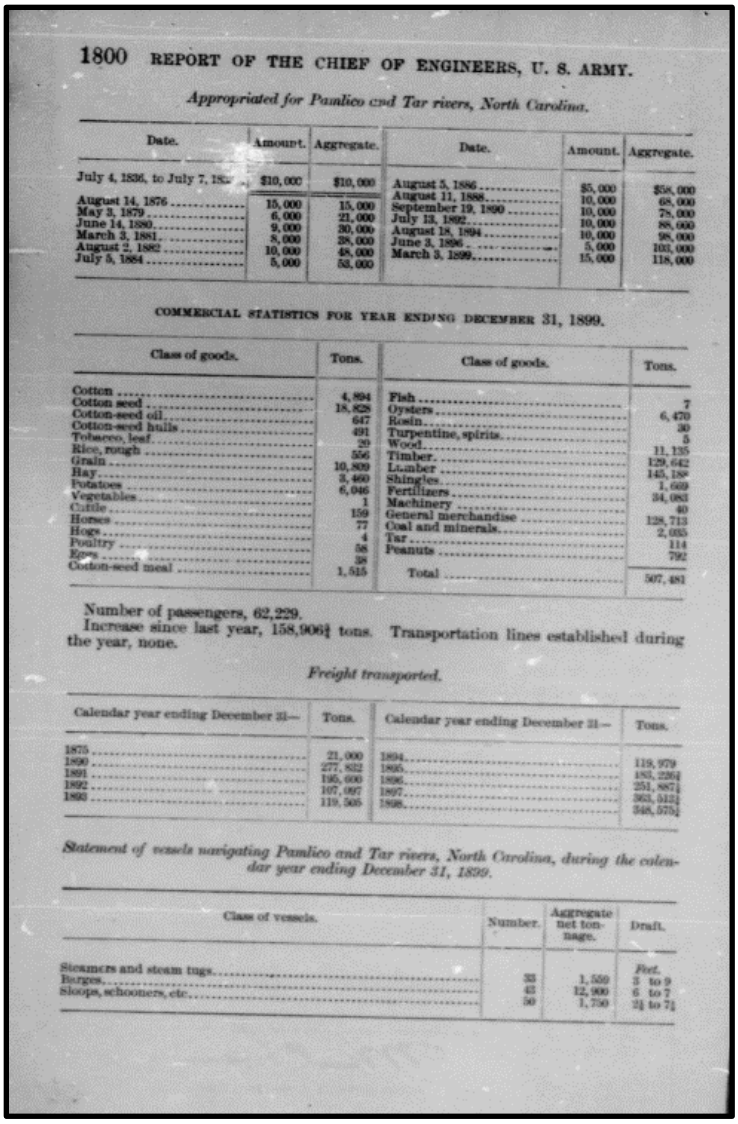
To June 30, 1899, $103,108.68 had been expended.

On June 30, 1899, the governing low-water depths were 7½ feet to Washington, 3 feet to Greenville, and 20 inches to Tarboro, and the river was well cleared to mouth of Fishing Creek and obstructed to some extent beyond that point.

During the year the shoalest part of the channel below Washington was dredged to 9 feet depth and the channel snagged to Fishing Creek. The governing low-water depths are 8 feet to Washington and 2 feet to Greenville and about 15 inches to Tarboro.

During the calendar year 1899 the commerce of the stream amounted to 507,481 tons, a gain over the preceding year of 158,906¾ tons. No transportation lines were established.

FIGURE 3: Page 267 of the 1900 USACE Annual Report, image by author (USACE 1900:267).



1800 REPORT OF THE CHIEF OF ENGINEERS, U. S. ARMY.

Appropriated for Pamlico and Tar rivers, North Carolina.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
July 4, 1836, to July 7, 18[illegible]	$10,000	$10,000	August 5, 1886	$5,000	$58,000
August 14, 1876	15,000	15,000	August 11, 1888	10,000	68,000
May 3, 1879	6,000	21,000	September 19, 1890	10,000	78,000
June 14, 1880	9,000	30,000	July 13, 1892	10,000	88,000
March 3, 1881	8,000	38,000	August 18, 1894	10,000	98,000
August 2, 1882	10,000	48,000	June 3, 1896	5,000	103,000
July 5, 1884	5,000	53,000	March 3, 1899	15,000	118,000

COMMERCIAL STATISTICS FOR YEAR ENDING DECEMBER 31, 1899.

Class of goods.	Tons.	Class of goods.	Tons.
Cotton	4,894	Fish	7
Cotton seed	18,828	Oysters	6,470
Cotton-seed oil	647	Rosin	30
Cotton-seed hulls	491	Turpentine, spirits	5
Tobacco, leaf	29	Wood	11,135
Rice, rough	556	Timber	129,642
Grain	10,809	Lumber	145,188
Hay	3,460	Shingles	1,669
Potatoes	6,046	Fertilizers	34,083
Vegetables	1	Machinery	40
Cattle	159	General merchandise	128,713
Horses	77	Coal and minerals	2,035
Hogs	4	Tar	114
Poultry	58	Peanuts	792
Eggs	38		
Cotton-seed meal	1,515	Total	507,481

Number of passengers, 62,229.

Increase since last year, 158,906¾ tons. Transportation lines established during the year, none.

Freight transported.

Calendar year ending December 31—	Tons.	Calendar year ending December 31—	Tons.
1875	21,000	1894	119,979
1890	277,832	1895	183,226¼
1891	195,600	1896	251,887¼
1892	107,097	1897	363,512¼
1893	119,505	1898	348,575¼

Statement of vessels navigating Pamlico and Tar rivers, North Carolina, during the calendar year ending December 31, 1899.

Class of vessels.	Number.	Aggregate net tonnage.	Draft.
			Feet.
Steamers and steam tugs	33	1,559	3 to 9
Barges	43	12,900	6 to 7
Sloops, schooners, etc	50	1,750	2½ to 7½

FIGURE 4: Page 1800 of the 1900 USACE Annual Report, image by author (USACE 1900:1800).

Waterfront Reconstruction Workflow

Once the theoretical framework was established, and the historical data collected, the next step in the process was to create a workflow for the 3D reconstruction of Washington's Waterfront. This workflow has taken a few different forms and has been modified from its original form laid out in the prospectus of this thesis. This workflow is in two stages, the creation of the photoshop Sanborn composite images and the 3D modelling of those images in Rhino 7.

Map Preparation (Photoshop)

The first major step in the reconstruction of Washington's waterfront was the creation of composite Sanborn maps for all the years studied in this thesis. These map years were the only ones readily available to the author and include: 1885, 1891, 1896, 1901, 1904, 1911, 1916, 1924, and 1943. Despite the relatively limited dataset, these represent a good sample size to illustrate the commercial decline of Washington's Waterfront. The early years represent the reconstruction and rise to prominence era, the maps around the turn of the century represent the height of Washington's economic prosperity, while the last few maps highlight the economic decline.

All Washington Sanborn maps were made of multiple parts with each part showing a detailed view of 2 to4 city blocks. These individual parts needed to be stitched together in Adobe Photoshop to create the composite maps of each year analyzed. One of the errors to consider during this research is that none of the individual Sanborn maps, and consequently the composites, are perfect. Many have relatively small margins of error, of 1 to5 percent, however, analysis indicated that as Washington grew and the maps became more complex, the margin of error increased. This could result from different methods or tools used by the surveyors, different individuals surveying different parts of the map, and potential errors in processing. The maps were stitched together as close as possible but inevitably problems arose where they are not perfectly aligned. All margins of error were between 1 and5 percent, with the later maps being within that higher range. An example of the start of the composite map creation process is given in Figure 5.

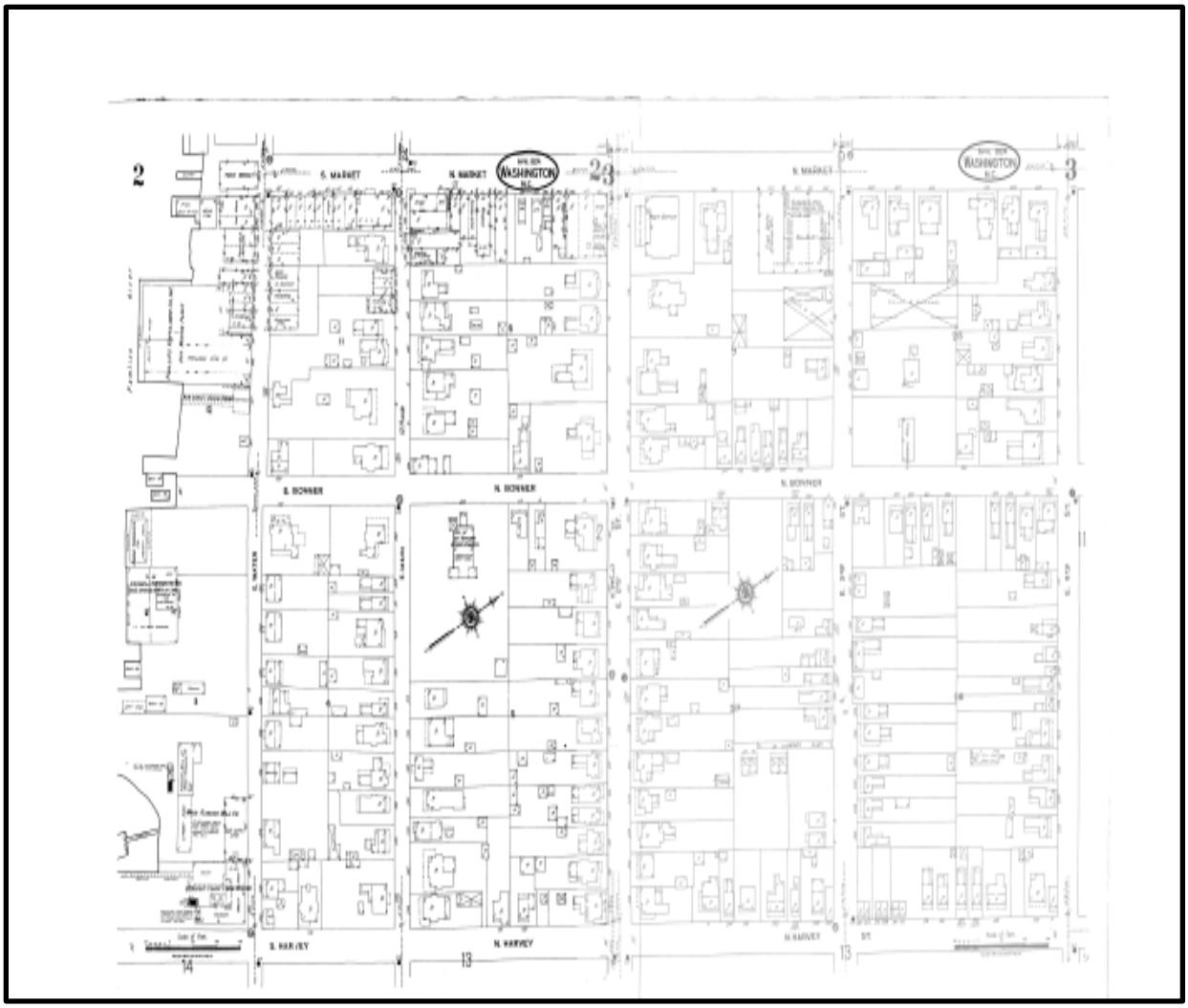


FIGURE 5: Screenshot of composite map creation process, taken by author (Courtesy of Sanborn Insurance Maps 1885).

The alignment process began with the importation of the Sanborn map components for the specific year being worked on. This process was done one year at a time. Once the first map was inserted, the next map could be placed, and the process could continue. However, due to the white margins on each side of each map, all other maps had to have their transparency reduced to 50 percent so that they could be aligned with the street network of the first map.

Even though the transparency was drastically reduced, the 50 percent level was a good medium between being able to effectively align the streets and blocks and still being able to see

the map. An important step after the alignment of the maps was to flatten the image. This creates a single image that removes layers. The integration of the layers into the background image helps reduce the file size of the final product. This process is done for each map until the composite map is completed. The white edges of the map were cropped out, as this also helps with computer memory and decreasing file size. Importing all the images at once was also tested, putting them in their general spot, then fitting them together one by one and flattening the image at the end. However, this process did not improve the time spent creating the maps and made it slightly confusing to fit the maps together due to the large amount of information on the screen. The composite map of Washington for 1885 provides an example of a completed, cropped, map and is provided in Figure 6.

One thing to note is that Sanborn maps are typically in color, however, these maps were originally scanned into the computer before the creation of this thesis and have no color. The colors on typical Sanborn maps denote various types of materials used in the construction of those buildings such as brick or concrete. The types of construction methods are also used to denoted by the use of colors such as frame or iron building. This research, however, is not focused on the façade or the architecture of those structures. This study only relies on the type of building such as dwelling or warehouse to be completed, so the color coded map and map key are not necessary to the successful completion of this thesis. The maps were then exported to a dedicated file folder, labelled based on the date, and saved as PDF files which are compatible with Rhino 7. The map creation process using these completed, composite Sanborn map images is discussed in the next section.

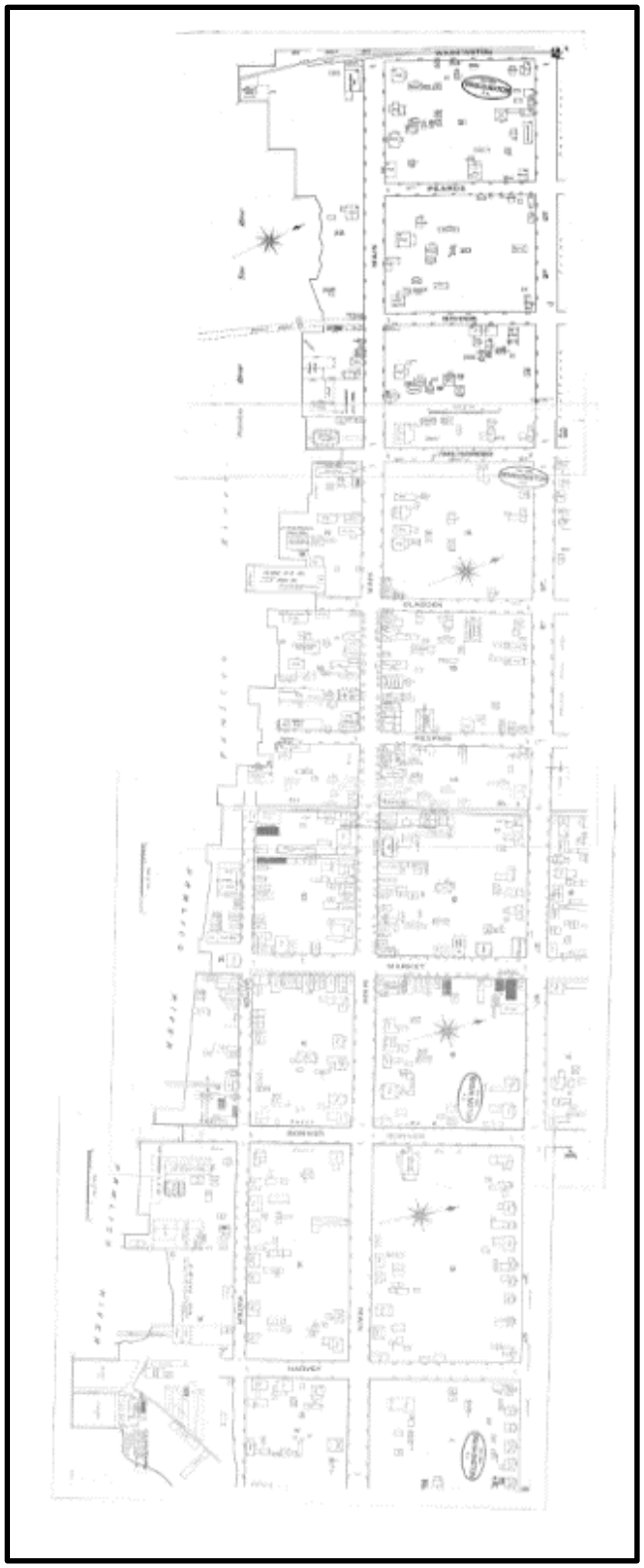


FIGURE 6: Completed 1885 Sanborn Composite Map, by author (Sanborn Insurance Maps 1885).

Model Creation (Rhino 7)

Once the composite maps were completed, they were imported into Rhino 7 for model creation. Rhino 7 is a 3D modelling software by McNeel that is used in many different industries from design to engineering. However, for this thesis, it was used to recreate the waterfront of Washington, North Carolina in a virtual space. Rhino 7 was chosen because of its intuitive nature, the author and advisor's familiarity to the system, and its easy integration into this study. This thesis intends to recreate Washington's waterfront with building and industry comparisons of varying colors in mind to analyze the waterfront industries.

Once the nine composite maps of Washington were created, they were then imported into Rhino 7. An important factor to consider when using Rhino 7 is that one must be sure to work in layers or one risks the project becoming confusing and unworkable. Each map was imported into its own layer so at the beginning of the project, there were nine layers, one for each year. Once this was completed, the author had to decide from which layer to begin modelling. One option was to start from the year 1885, the first Sanborn map available, and work chronologically through the years until reaching the last Sanborn map available. This option required more work as buildings are added to the maps each year and required modelling as the maps grew and changed. However, the reconstruction based on the 1885 map would be more accurate because the margin of error is less than 1 foot compared to around 10 feet for one of the sections of the 1943 map. The second option was to start at 1943 and move down the years until 1885. This was seen as possibly more efficient as most buildings are placed on the 1943 map and could be removed or moved without having to completely recreate them each year. However, it is less accurate as 1943 is the most inaccurate Sanborn map with a large margin of error and due to the incorrect scale on one of its component parts, its composite map is poorly stitched together. Due

to these factors, the author elected to begin with 1885 and move up chronologically to 1943. One important aspect to note is that since layers can be duplicated in Rhino 7, while buildings additions were required every year, there was no need to completely recreate the waterfront for every year.

Another important component of the 3D reconstruction was the fact that only the waterfront and all buildings south of Main Street would be reconstructed. Most buildings north of Main Street are either residential structures or general town businesses like saloons or grocers. These types of buildings are not the focus of this thesis and while they can help track town growth regarding population, that information is already provided through previous historical research.

Once these general ideas had been established, the parameters of the Rhino 7 scene had to be set. These parameters included setting the scale and the extent of the grid system. The scale used in this Rhino reconstruction is in feet with one foot for every minor grid line. This was chosen because each Sanborn map's scales are in feet. This was changed by going into file>properties>grid and changing the minor grid line spacing to 1 foot. Major lines were set at every five feet. The absolute tolerance was also kept at the default .0001 feet. The grid line count was set at 5000 feet because that length was enough to fit every one of the maps.

The next step is the importation of each of the composite maps into their own layers. These layers also included sublayers, but these will be discussed further on in this chapter. Once completed, the author began at the 1885 map and outlined the waterfront and the city blocks. This was done with the hope of being able to snap the other maps to the positions of those blocks and make the entire reconstruction process as precise as possible. An example of this step is shown in Figure 7. Once the block and waterfront outlines were created, other maps were

selected in chronological order to determine if their snapping on top of the initial layer worked. It was found out that the 1891 and 1896 maps fit well onto the 1885 map, however, in the following years discrepancies resulting from surveying, scaling, and Photoshop errors made this strategy ineffective.

FIGURE 7: Screenshot taken by author of the outlined waterfront and blocks of the 1885 Washington Sanborn Map (Sanborn Insurance Map 1885).

Sanborn map terminology also had to be determined to accurately reconstruct and analyze the waterfront. Sanborn included its own set of symbology, abbreviations, and terminology used to distinguish different types of structures. Luckily many of the larger companies and structures were fully spelled out and abbreviations such as 'dwg' were easily deduced to mean dwelling. Regardless, a key to the Sanborn maps is included in Appendix A and can be used for each year from 1885 to 1943.

Another important element to consider before the modelling could begin was the height of buildings. The Sanborn maps provides the number of stories of the buildings, but exact heights are not included. This issue was solved by measuring the height of a story of the Eller House on the East Carolina University Campus. Being built in 1925, it serves as a good representation of the height of stories for buildings during the time around the creation of the Sanborn Maps. Using a tape measure, one story was measured at 10 feet. That has been applied to the modelling process and buildings of one story are 10 feet high, 2 stories are 20 feet high, and so on.

Once all these factors had been set, the actual modelling of structures began. Beginning with the 1885 map, the author created a 3D model of all the labelled buildings located south of Main Street. This was done either by using the *draw rectangle* or *polyline* function, then using the *extrude curve* command with the solid option and then typing in the height of the building.

After making some adjustments, the author worked with seven different sublayers for each type of structure and each sublayer had its own color to differentiate it from the others. The *Agriculture and Fishing layer* represents buildings related to the capture, sale, and processing of aquatic fauna and the sale or processing of agriculture such as tobacco or cotton. The *Lumber, Shingles, and Turpentine* layer represents structures related to the sale or processing of those

goods, which were a large part of Washington's waterfront economy. The *Warehouse* layer is for any general warehouses which will help visualize the volume of goods flowing through Washington during those years. *Transport* represents any structure related to modes of transportation including stables, boathouses, railroad houses, and railroad tracks. The *Shipyard* layer shows all the shipyards on the waterfront and helps to assess the productivity of the shipping industry. The *Foundry and Machine Shops* layer represents businesses associated with the repair and manufacture of machinery and hardware. The most general layer, *Town Buildings*, represents all buildings not associated with waterfront business. This includes dwellings, saloons, general offices, grocers, and other buildings that are not directly related to determining the causes of decline in Washington's waterfront industries. These buildings were modelled because they fill in the background growth of the city, but they are not used to directly measure the commercial success of the waterfront.

These structure types were grouped together because an initial trial of creating layers for each type of building led to the map becoming a convoluted mess of colors where the important structures of the waterfront were drowned out by the less important general town buildings. This created a problem with identification and classification of the waterfront structures where an effective analysis would have been impossible. These categories represent the largest industries of the historic port of Washington. They are effectively grouped together, and an analysis of each classification's commercial output is completed later in this thesis. An example of the completed 1885 map and key with the described layers is given below in Figures 8 and 9.

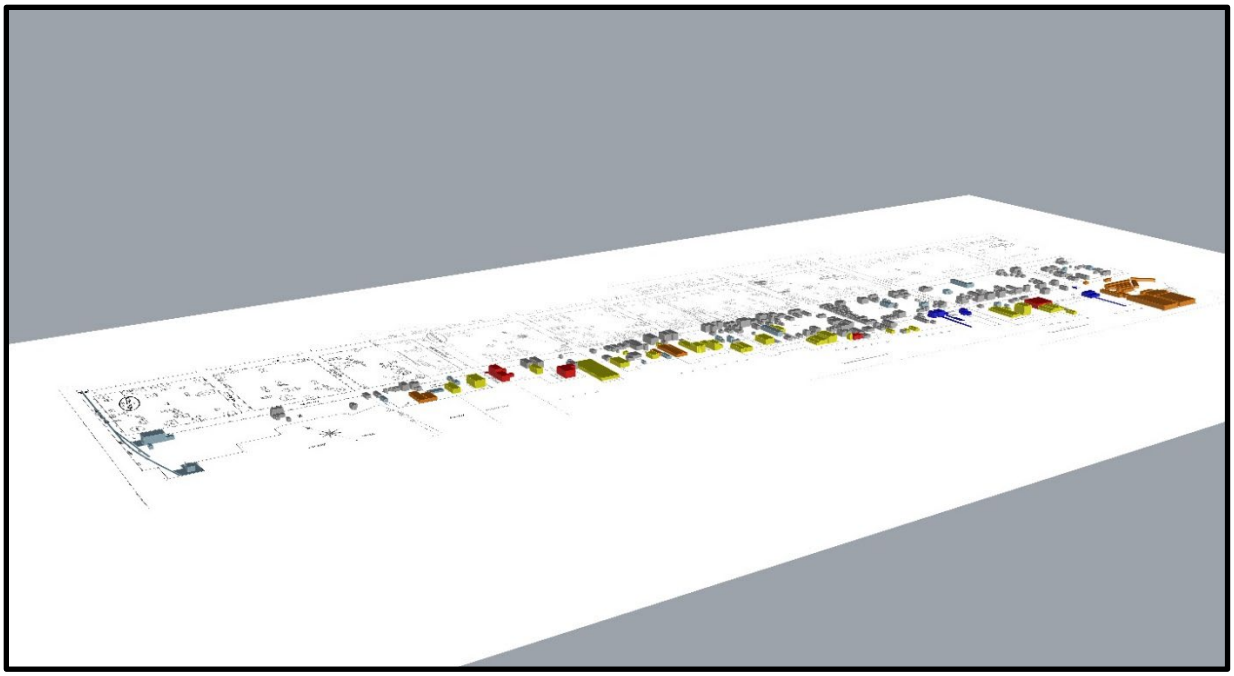


FIGURE 8: A view of the 1885 Reconstructed Washington waterfront looking North across the Tar River (Created by author, 2021).

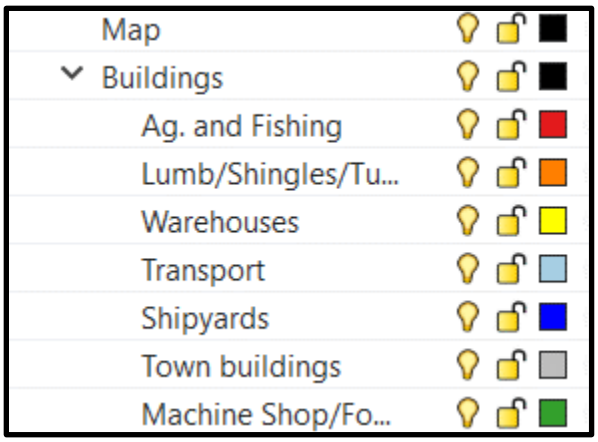


FIGURE 9: Key for the Washington waterfront Reconstruction layers (Created by author, 2021).

Once the layers were set and the 3D modelling of the buildings completed, the design process began. Colors for the buildings were changed multiple times until the right combination was found. The waterfront for all the maps was also traced and duplicated. The duplicate layer was renamed “City Background” which provided a general backdrop for the buildings once the

Sanborn map was turned off. The waterfront was modelled by extruding the waterfront layer down five feet. Five feet was chosen as a round number for the distance between the water and the current height of the waterfront. Although the number is arbitrary, it is added strictly for the visual representation of the 3D model and has no bearing on the analysis of the historical waterfront. Text was then added to help orient the reader into the 3D space, as it may be quite confusing if one has not previously observed the area in question. Labels for the Pamlico Sound were inserted and colored blue. Text labelled northwest, center, and southeast were inserted to denote which area of the city the reader is looking.

Three blocks, one colored green for northwest, yellow for the center, and orange for southeast were inserted as well. This was done to provide a color-coded frame of reference. There is also a small overlap for each box to help find the ending and beginning of the next map. These were put into place because of the length of the city necessitated the author to divide each 3D modelled map into these three sections. These three sections are cropped in the results chapter and stacked on top of each other as shown below. It is meant to be viewed looking at the northwest then to the center and finally to the southeast. This also is done to give the most detailed view of the waterfront. The size and density of the structures was also important to portray as they represent the growth and decline of the waterfront. The sonar data was also inserted into the 1943 map (to be discussed below). Once the modelling and the design process was complete, the data was exported using view>capture to file>save file to designated folder. The exported files were then imported into photoshop, and each map was cropped into the three sections. An example of a before and after image of a cropped map is shown below in Figures 10, 11, 12, and 13.

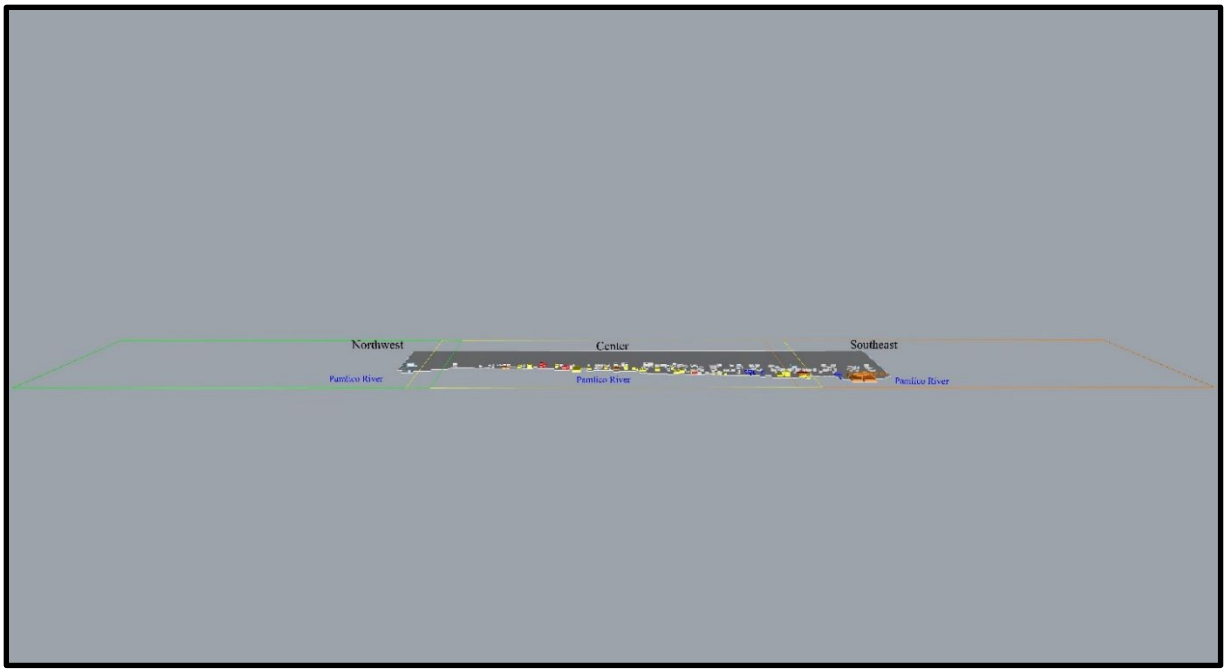


FIGURE 10: Uncropped image of the finalized 1885 map (Created by the author, 2022).

FIGURE 11: Cropped northwest side of the finalized 1885 map (Created by the author, 2022).

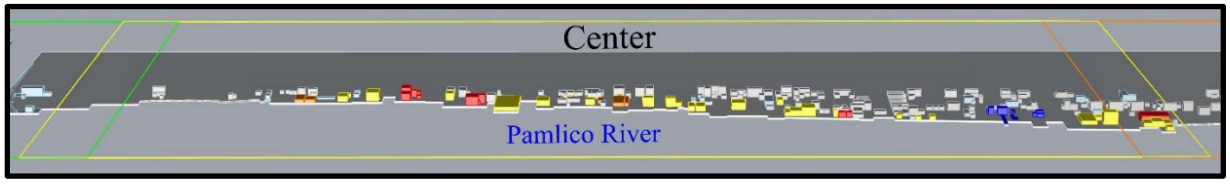


FIGURE 12: Cropped center view of the finalized 1885 map (Created by author, 2022).

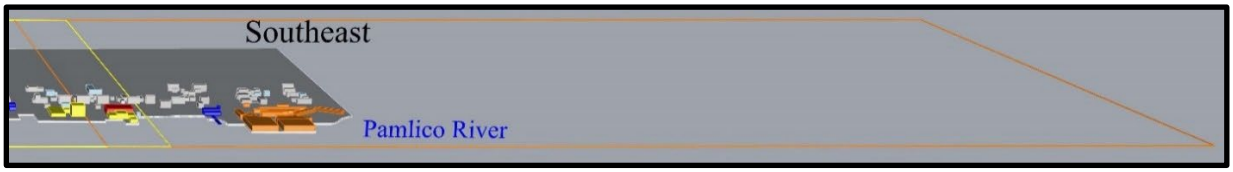


FIGURE 13: Cropped east side of the finalized 1885 map (Created by author, 2022).

These reconstructions were later augmented with tables of the economic data for each industry. Prior to this a table was added to interpret the labels and colors for each industry that

include the total tonnage production and area in square feet covered by each. An example of this is given below in Table 1.

Layer	Color	Tons	Area (Sq. Feet)
Ag. and Fishing			
Lumber/Shingles/Turpentine			
Warehouses			
Transport			
Shipyards			
Town Buildings			
Machine Shops/Foundry			
Merchandise/Misc.			
Total			

TABLE 1: Table for each year showing the total tonnage produced and the area in square feet covered by each industry (Created by author, 2022).

In Chapter 5, each industry is described individually with all the goods produced during a particular year. These total tonnage amounts were further divided and described using Table 2 below. The *Merchandise/Miscellaneous* industry does not appear on the map because there were no clear buildings for that industry.

Category	Product	Tons
Ag and Fishing	Cotton and Cotton Products	
	Veg/Grain/Starch	
	Livestock	
	Fisheries Harvest	
	Other	
	Total	
Lumber/Shingles/Turpentine	Lumber/Timber/Logs	
	Shingles	
	Naval Stores/Turpentine/Rosin	
	Other	
	Total	
Machine Shops/Foundry	Machinery	
	Iron Goods	
	Hardware	
	Other	
	Total	
Merchandise/Miscellaneous	Merchandise	
	Raw Materials	
	Construction Materials	
	Fertilizer Products	
	Oil Products	
	Other	
	Total	

TABLE 2: Breakdown of the production for each industry (Created by author, 2022).

This breakdown shows a standardized grouping for each industry so that the actual composition of each can be interpreted in the analysis chapter. The tons shown in the tables above represent the total amount of commercial activity for each industry including production and shipment. Table 3 below shows the final table used for each year; it shows the federally expended funds and the total commerce for each year in both the years dollar amount and a standardized 2022-dollar value.

	1896/2022 Dollars
River Improvement (Federally Expended)	
Total Commerce	

TABLE 3: Shows the federally expended value and the total commercial value of goods for each year (Created by author 2022).

The methods described in this section incorporates data from the nine Sanborn maps to create a time progression synchronic map of the growth and decline of Washington's Waterfront in Chapter 5. These results are used to analyze the diachronic changes of the waterfront in the Chapter 6.

Archaeological Data Collection

Archaeological data is used in conjunction with the 3D reconstructions of Washington's waterfront. In the spring of 2021, sonar data of the riverbed at the existing waterfront was collected. Using an EdgeTech 4125 side scan sonar running at both 400 and 900 Hertz, recorded data from north of the current bridge over the Tar River at Washington, to the southern tip of the Old Waterfront where the remains of the train trestle are now located. Once collected, the data was processed using SonarWiz software. Initially the lines were bottom tracked using both manual and automatic features. The contrast of the lines was then adjusted using the Empirical Gain Normalization (EGN) feature, which uses overlapping layers of sonar lines to average the

data in each set of lines and create a clearer, and more illuminating image. This data, both with and without a map of Washington attached, was then exported into photoshop as a .TIF file, converted into a .JPEG file, and then imported as a layer into Rhino 7. This layer was imported below the 1943 layer so that the map attached was not visible but also because the 1943 map and its recorded waterfront is the closest map available to the archaeological record recorded using the side scan sonar.

Figure 14 shows the most recent waterfront scans, from 2021, superimposed on the 1943 waterfront reconstruction. The sonar data is a picture of the riverbed with color variations denoting changes in height of structures or anomalies. The left side of the data, close to the large lumber mill, does not reveal apparent in situ structural remains. However, the right side of the image is of particular interest. The large dark spot roughly in the middle are the pilings for the existing bridge that crosses the Tar River. Past the bridge to the right is the current waterfront which is the slightly darker line that is extending out further out into the Pamlico River than the reconstructed buildings. The current waterfront in front of the reconstructed buildings and the waterfront further to the right, near the lumber mill, are examined further in the analysis chapter. The large blank spot in the sonar data towards the right of the map is the location of a current tidal pond and terrestrial development which was not able to be scanned by the sonar. This will determine if any *in situ* archaeological remains are visible and are compared or possibly identified using the reconstruction. The use of this archaeological data helps to determine the locations of future areas of archaeological interest. The ability to predict locations where structures may be located without the need for intrusive methods of discovery is one of the important applications of this methodology.

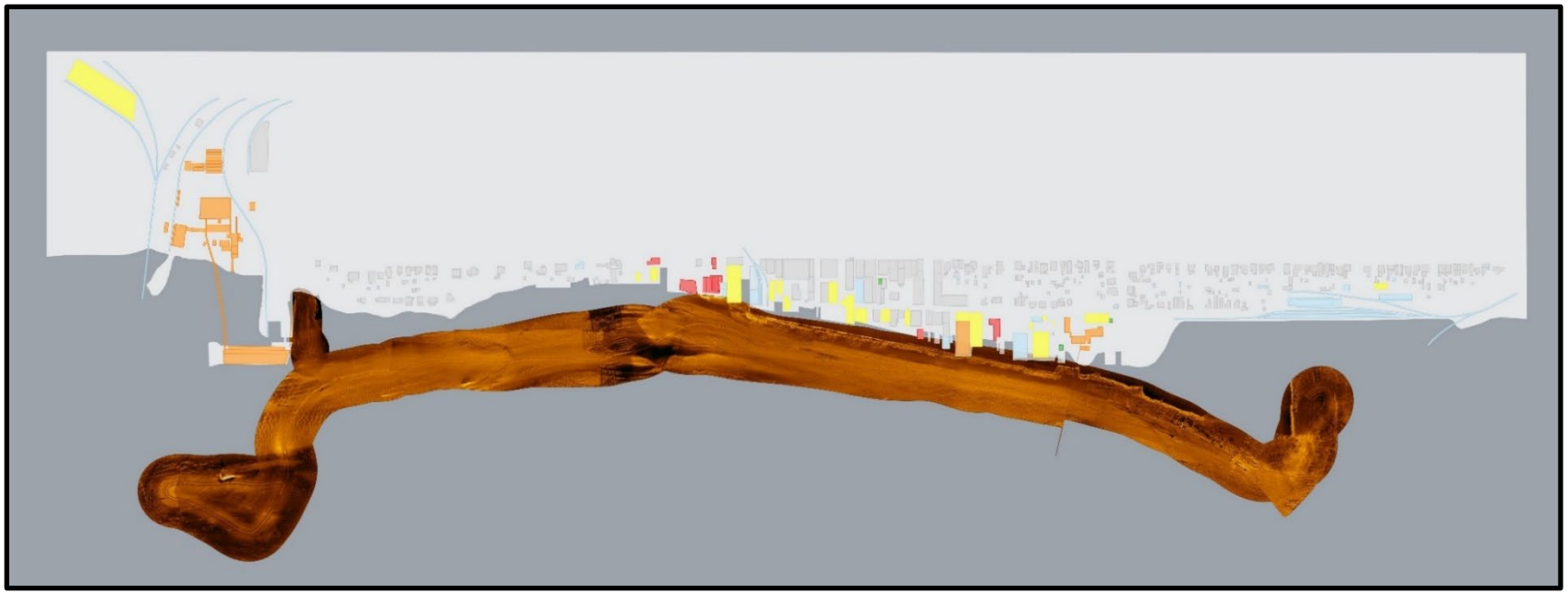


FIGURE 14: Sidescan Sonar Data overlayed onto the 1943 Washington Reconstruction (Created by author, 2022).

Analysis Methods

Chapter 6 uses the historical data and reconstructions outlined in Chapter 5 to draw conclusions about the history of Washington's waterfront. Commerce is analyzed first using collated production tonnage data. Each industry that has production values are then analyzed in detail. The breakdown tables described above were used to analyze the *Agriculture and Fishing* industry, the *Lumber, Shingle, and Turpentine* industry, the *Foundry and Machine Shops* industry, and the *Merchandise and Miscellaneous* industries individually.

The sonar data is examined further with the *Agriculture and Fishing* industry and the *Lumber, Shingle, and Turpentine* industry. This is done because these two industries are emblematic of the historic waterfront. In situ archaeological remains or possible locations for further exploration may become apparent when combining the reconstructions with the sonar data. Once these data points are analyzed, total commercial production tonnage is compared with the square footage for each year to determine if there were any correlations between the two. Total commerce and river improvement is analyzed afterwards to determine if there are any connections between the two values. Conclusions on the development of the waterfront are then drawn from the multiple analyses.

CHAPTER 5: MODELLING WASHINGTON'S ECONOMIC CHANGE, A YEAR-BY-YEAR SYNOPSIS

Introduction

This chapter discusses the results of the research conducted in this study. The Sanborn map for each year studied through the course of this thesis (1885, 1891, 1896, 1901, 1904, 1911, 1916, 1924, and 1943, sequentially) is examined using 3D models as well as the historical data gathered from the USACE reports. The historical data from the reports is embedded within the 3D models through tables that list the tonnage and square footage of each layer. Tables with federally expended funds for the Pamlico River improvement, total river commerce, and ship travel data are also included. Scans of the USACE scanned pages from the various reports are included as Appendix A. All these fragments of economic data are integral to understanding the entire story of Washington's waterfront advance and decline. Correlation or divergence between these values may shed further insight into the waterfront's history. While the values described in this chapter are offered in the form of a synchronic (snapshot in time) approach, the next chapter presents a diachronic analysis of waterfront change.

In this chapter, each year listed has the 3D reconstructed view of Washington's waterfront which visualizes the growth and contraction of industries on the waterfront. Tables containing historical data are used, as previously mentioned, to contextualize the changes to the waterfront. Descriptions further enhance and connect the historical data to the visualization. The goal is for each one of these components to come together to provide a holistic view of the visual and economic changes of Washington's waterfront.

The description for each year analyzed commences with a short introduction followed by images of the waterfront reconstruction. Each industry is differentiated by color which is labelled and contextualized through the tables located underneath the images of the reconstruction. Each image for each year was taken at the exact same angle to ensure a continuous frame of reference.

Due to the size constraints of the printed pages appearing in this thesis, each reconstructed waterfront was divided into three parts, a view of the northwest of the waterfront, one of the center view, and one of the southeast view. To correctly frame the viewer, they are 'standing' in the middle of the Pamlico River looking due northeast towards Washington's waterfront. An orientation map illustrates this view below in Figure 15. Each visualization is meant to be viewed linearly, from northwest to southeast or vice versa, which will help create a continual image and frame of reference when compared to the other visualizations.

FIGURE 15: Visual context of the location of Washington on the Pamlico River and where the viewer is looking from in the direction of the waterfront. (Adapted from Google Earth, with text and arrow added by author.)

1885

Below is the reconstruction of the 1885 Washington waterfront (Figure 16). This was the least developed of all the years researched. Even though this is the case, a variety of industries appear which will become the foundation of Washington's economic future as the years progress. To understand the key, the industry colors in Table 1 correlate the corresponding industry on the 3D reconstruction.

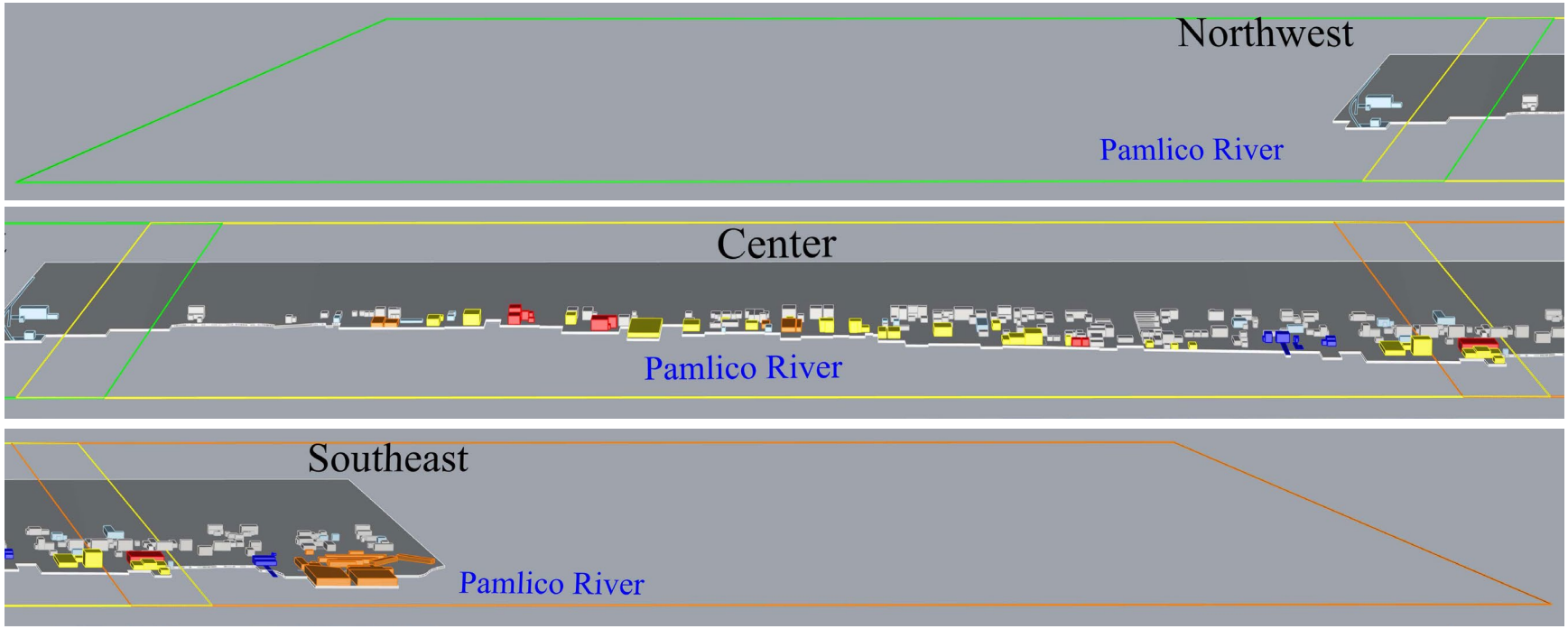


FIGURE 16: 3D model of Washington's waterfront in 1885, Sanborn-Perris Map Co. Limited (Created by author, 2022).

Table 4 below denotes the color for each industry as well as the amount of goods produced and the space on the waterfront that each industry occupied.

Layer	Color	Amount	Area (Sq. Feet)
Ag. and Fishing		27,054 Cotton Bales 5,353 Rice Barrels 8,115 Potatoes	13,116.2
Lumber **Shingles** **Turpentine**		94,686 Feet 917,029 Shingles 4,732 Barrels	53,906.5
Warehouses		-	57,659.6
Transport		-	29,683.4
Shipyards		-	9,455.5
Town Buildings		-	122,903.7
Machine Shops/Foundry		-	0
Merchandise/Misc.		9,552,697	-
Total		10,609,656	286,724.9

TABLE 4: Industry color key with goods produced and total area occupied by that industry in 1885 (USACE 1885:1041-1042).

The commercial statistics for 1885 provide a baseline for the commercial goods that Washington produced during this period. One important factor to note is that these statistics only come from the Clyde and Old Dominion Steamship companies. While there was undoubtably lower-level trade coming through the town that did not involve either of those companies, there are no statistics for that volume of commerce (USACE 1885:1042).

The *Agriculture and Fishing* industry included bales of cotton, barrels of rice, and potatoes. The *Lumber, Shingles and Turpentine* industry was significant in 1885 and included the manufacturing of shingles, barrels of naval stores, and feet of lumber. *Merchandise and Miscellaneous Goods* also made up a large percentage of production (USACE 1885:1042). The *Town Building* layers, while not having any explicit economic impact, represents general town growth or decline and will be further discernable as the chapter progresses. *Transportation* includes stables, railroad junctions, and railroad lines. *Warehouses* held an assortment of goods and merchandise which was not specified on the Sanborn maps. *Machine Shops and Foundries* were not located on the map and did not explicitly produce any goods. Since there was no

mention of the use of shipyards as well, no data was included in the *Shipyards* layer. The *Merchandise* layer includes a cumulative number for various, unspecified merchandise that Washington produced. No cumulative commerce numbers are available (USACE 1885:1041-1042).

Table 5 shows the breakdown of goods for each industry and the standardized weight in tons that each produced. The tonnage was determined with a few assumptions; that a bale of cotton weighed the standard 480 pounds (U.S. Cotton Bale Dimensions 2022), a standard rice barrel weighed 148 pounds (United States Department of Agriculture 1904:83), and a standard 8 ounce potato (Nunn and Qian 2009:599), a standard 250-pound barrel of naval stores (Vance 1896), shingles of white pine in 20 per bundle at 40 pounds per bundle(Sokol 2021) at 40 pounds per bundle (Luttrell 2021).

Category	**Product**	**Tons**
Ag and Fishing	Cotton and Cotton Products	6,493
	Veg/Grain/Starch	397.4
	Livestock	0
	Fisheries Harvest	0
	Other	0
	Total	**6,890.4**
Lumber/Shingles/Turpentine	Lumber/Timber/Logs	426.1
	Shingles	1,146.3
	Naval Stores/Turpentine/Rosin	591.5
	Other	0
	Total	**2,163.9**
Machine Shops/Foundry	Machinery	No Data
	Iron Goods	No Data
	Hardware	No Data
	Other	No Data
	Total	No Data
Merchandise/Miscellaneous	Merchandise	N/A
	Raw Materials	No Data
	Construction Materials	No Data
	Fertilizer Products	No Data
	Oil Products	No Data
	Other	No Data
	Total	**N/A**

TABLE 5: The breakdown of production tonnage for each industry (USACE 1885:1042).

These assumptions are based on historical as well as modern standards. While it is far from perfect, it gives a good idea of Washington's production capacity in 1885. Merchandise was not labelled because an unspecified amount rather than tonnage of merchandise was described in the report. Table 6 shows the federally expended dollar amount for 1885 but excludes the total commerce for the year as it was unavailable. The dollar amounts have been listed to show 1885 value, as well as standardized for 2022.

	1885/2022 Dollars
River Improvement (Federally Expended)	3,749.83/107,779.39
Total Commerce	-

TABLE 6: Federally expended money and total commerce for 1885 (USACE 1885:161-162).

Starting in 1876, the federal government expended funds to clear the Pamlico River and increase its commerce. Washington had been blockaded and put under siege several times during the Civil War. The blockade included pilings placed underwater downstream of the city to intercede and prevent traffic. Along with these wartime obstacles, tree stumps, imposing logs, and sunken watercraft were removed. The river was also to be straightened, widened, and deepened; the project called for the river to be widened to at least 108 feet and 9 feet deep at low water from the Pamlico Sound to Washington's waterfront by 1885 (USACE 1885:161-162)

1891

Figure 17 below shows the 3D reconstruction of Washington's 1891 waterfront. Growth in industries such as *Lumber, Shingles, and Turpentine* and *Machine Shops and Foundries* is visible from the 1885 map. *Agriculture and Fishing* is starting to take up more of the central waterfront area as well along with a slight growth in the number of *Warehouses*. The data is taken from the Sanborn-Perris Map Co. which created the base fire insurance map in 1891.

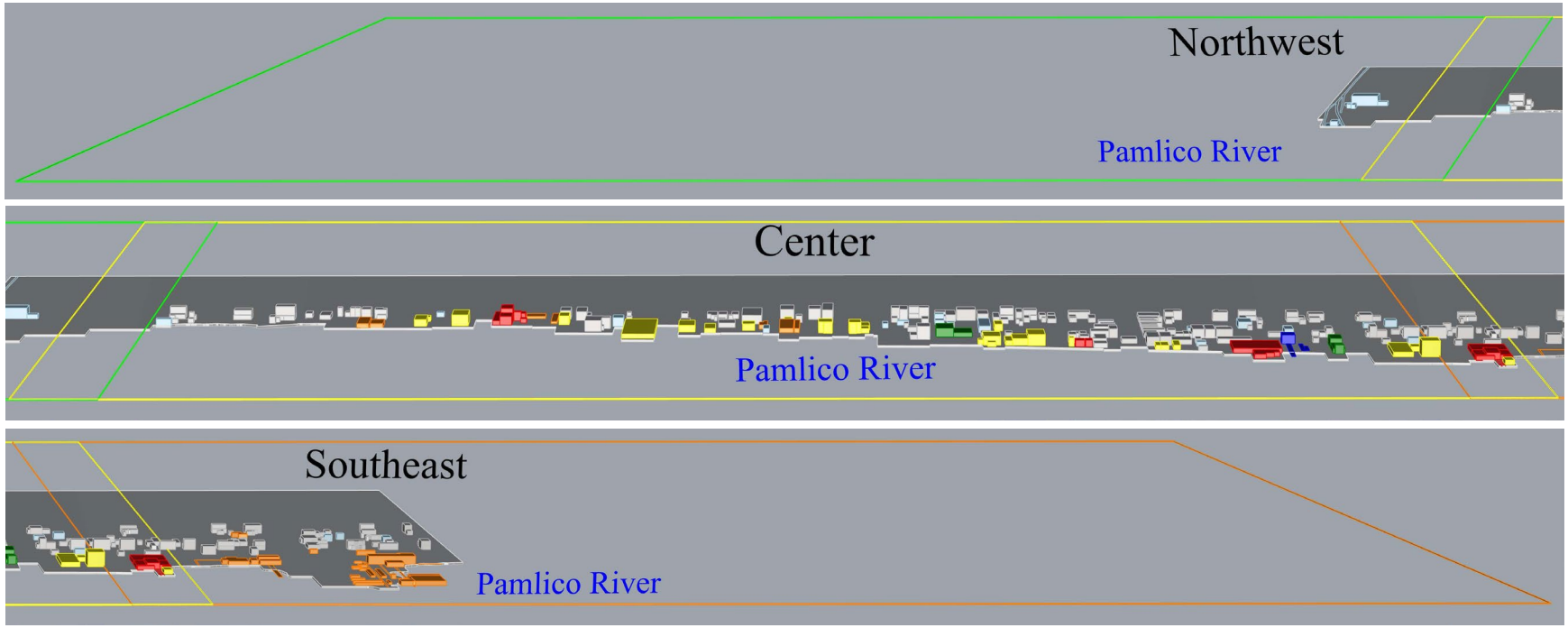


FIGURE 17: 3D model of Washington's waterfront in 1891, Sanborn-Perris Map Co. 1891 (Created by author, 2022).

Transportation remains an important factor of Washington during this time as well. Stables occupy most of the central and southeastern waterfront, while a railroad line is present on the northeastern portion of town. Many of the buildings appear to be increasing in height as commerce expands as well. These changes will become more apparent as the chapter progresses.

Table 7 provides the commercial statistics for Washington's waterfront in 1891. The amounts have been standardized to tonnage and a breakdown of each industry is described as well. All data was taken from the USACE Annual reports for 1891 and 1892; 1892 has been included because it has the commercial statistics for the previous year.

Layer	Color	Tonnage	Area (Sq. Feet)
Ag. and Fishing		20,600	30,252.7
Lumber/Shingles/Turpentine		151,000	45,117.8
Warehouses		-	53,558.4
Transport		-	26,859.4
Shipyards		-	3,639.3
Town Buildings		-	140,203.9
Machine Shops/Foundry		1,000	8,142.7
Merchandise/Misc.		23,000	-
Total		195,600	307,773.4

TABLE 7: Industry color key with goods produced and total area occupied by that industry in 1891 (USACE 1892:1122).

The commercial statistics, in contrast to the report from 1885, are thorough and represent a good accounting of the overall commerce of Washington. The report states that the statistics were compiled by Assistant Engineer William H. Chadbourn, Jr. after extensive correspondence and conversations with steamboat captains and agents, custom house officials, and prominent shippers and merchants (USACE 1892:1122).

As indicated in the table, *Agriculture and Fishing* comprise 10.5% of Washington's total exports in 1891. For this year, the industry included cotton and cotton products, tobacco, rice, grains and forage, vegetable and truck, livestock, fish, oysters, and other shellfish. The *Lumber, Shingle, and Turpentine* industry was by far the largest industry in Washington at the time with over 150,000 tons of goods produced. It manufactured lumber and lumber products as well as naval stores. *Warehouses* were used to store various products. *Transportation* in Washington this year included railroads, railway station, stables, and boathouses. No ships were produced in 1891, however, there was a shipyard located on the waterfront. *Town Buildings* included

dwellings but also merchandise proprietors, offices, grocers, and other non-categorical buildings. *Machine Shops and Foundries* first appear on the waterfront and produce machinery. *Merchandise and Miscellaneous Goods* included coal, minerals, and fertilizers. A breakdown of the various goods in each industry is provided in Table 8 (UASCE 1892:1122).

Category	**Product**	**Tons**
Ag and Fishing	Cotton and Cotton Products	7,000
	Veg/Grain/Starch	5,250
	Livestock	200
	Fisheries Harvest	8,000
	Other	150
	Total	**20,600**
Lumber/Shingles/Turpentine	Lumber/Timber/Logs	150,000
	Shingles	0
	Naval Stores/Turpentine/Rosin	1,000
	Other	0
	Total	**151,000**
Machine Shops/Foundry	Machinery	1,000
	Iron Goods	0
	Hardware	0
	Other	0
	Total	**1,000**
Merchandise/Miscellaneous	Merchandise	20,000
	Raw Materials	3,000
	Construction Materials	0
	Fertilizer Products	0
	Oil Products	0
	Other	0
	Total	**23,000**

TABLE 8: The breakdown of production tonnage for each industry (USACE 1892:1122).

. These sectors are standardized and are used in the analysis of Washington's economy. Table 9 below gives the dollar amounts for the federally supported river improvement, as well as the commerce that flowed through Washington in 1891. The dollar amounts have been listed to show 1891 value, as well as standardized for 2022.

	1891/2022 Dollars
River Improvement (Federally Expended)	2,617.34/80,863.73
Total Commerce	4,874,000/206,573,133.51

TABLE 9: Federally expended money and total commerce for 1891 (USACE 1891:1349).

The federal government continued to invest in the improvement of the Pamlico River around Washington and even further up the Tar River to Greenville and Tarboro. The work of 1885 continued with the clearing of the Civil War blockade debris as well as the dredging of the river and the removal of natural hazards such as logs and stumps. Survey operations were also conducted further up the Tar River around Greenville and Tarboro. The dredging of the river was intended to create a 108-foot wide and 9-foot-deep good channel up to Washington at low water (USACE 1891:1349).

There were 16 vessels that frequented Washington's waterfront in 1891 These ships varied from steamers of 400 tons to small tugboats of 10-20 tons for a total tonnage of 1,916. Five steamers travelled regularly from Washington to Norfolk, Virginia, with another two travelling to Tarboro. The rest had irregular schedules with no distinct destinations. Passenger data was not recorded for 1891 (USACE 1891:1349).

1896

Figure 18 below shows the 3D reconstruction of the waterfront in 1896. Large changes are noticeable from 1891, including a large lumber company which appears on the northwest side of town. A railroad also appears which services the center of the town, and the waterfront. The overall number of industrial buildings increased, especially for the *Agriculture and Fishing* and the *Lumber, Shingles, and Turpentine* industries.

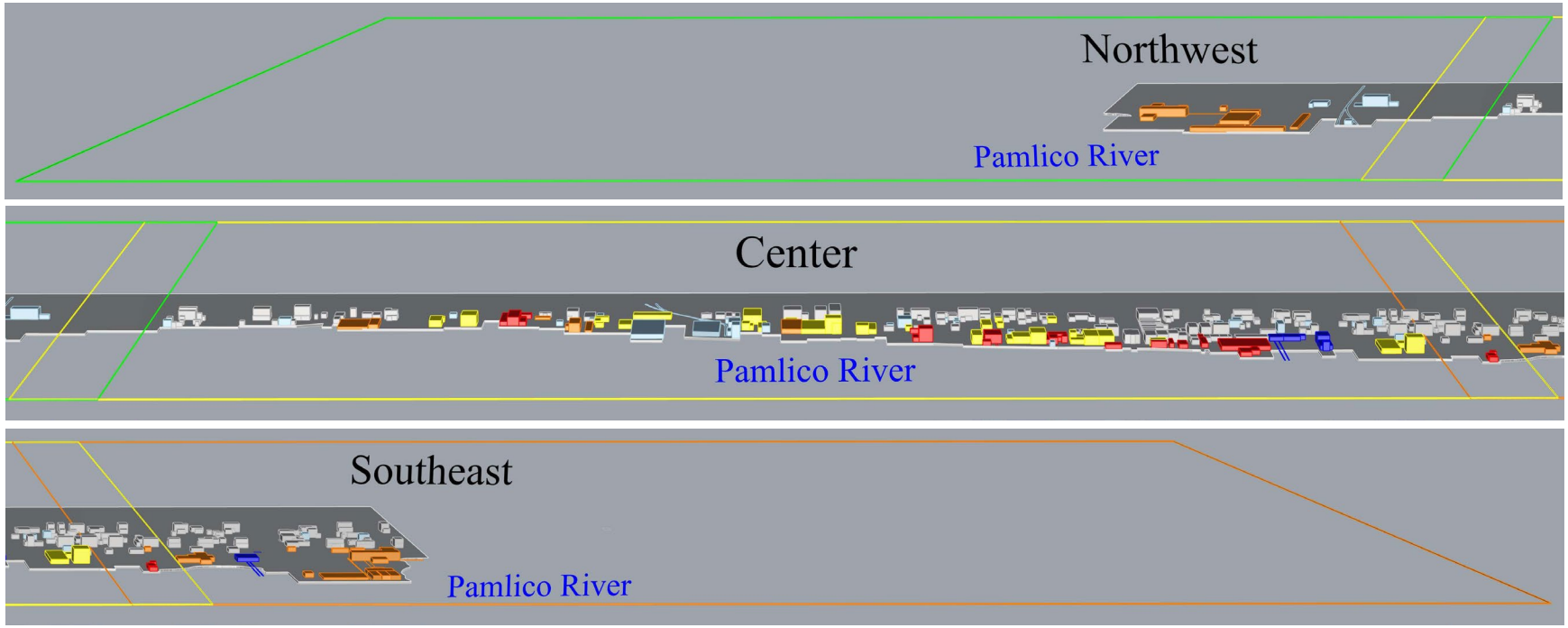


FIGURE 18: 3D model of Washington's waterfront in 1896, Sanborn-Perris Map Co. 1896 (Created by author, 2022).

Rapid expansion of the waterfront area is clearly visible by this time. Along with the previously mentioned increases in *Lumber, Shingles, and Turpentine* and *Agriculture and Fishing* industries, *Transportation* has a corresponding technological increase as well. The number of railroad stations doubles with the number of stables decreasing slightly. The number and height of waterfront *Warehouses* also has increased drastically since 1885.

Table 10 below offers the overall commercial statistics for each industry on Washington's waterfront for 1896. These are standardized tonnage amounts and square feet of space occupied. All data is taken from the USACE Annual Report for 1896.

Layer	Color	Tons	Area (Sq. Feet)
Ag. and Fishing		19,024	33,075.5
Lumber/Shingles/Turpentine		110,859	92,966.6
Warehouses		-	57,998.9
Transport		-	49,434.3
Shipyards		-	12,164.6
Town Buildings		-	138,509.9
Machine Shops/Foundry		-	-
Merchandise/Misc.		53,191	-
Total		183,225.5	384,149.8

TABLE 10: Industry color key with goods produced and total area occupied by that industry in 1896 (USACE 1896:1102).

A variety of goods in the *Agriculture and Fishing* industry were produced at Washington during 1896. Cotton, cotton seed, and cotton seed meal, tobacco leaf, rice, grains, hay, potatoes, vegetables made up the agricultural portion of this sector of the economy. Livestock consisted of cattle, horses, hogs, poultry, and eggs. Fish and oysters were also produced by Washington in 1896 (USACE 1896:1102). The *Lumber, Shingles, and Turpentine* industry was similarly characterized by an increasing number of specific products during this year. Rosin, crude turpentine, turpentine spirits, wood, timber, lumber, and shingles made up this sector of the economy. *Warehouses* accounted for a large square footage on the waterfront and housed the goods ready for shipment by water or rail. *Transportation* included railways, railroad stations, stables, and boathouses. *Shipyards* only occupied one location on the waterfront. *Town Buildings*, on the other hand, took up the most space of the building categories. No *Machine Shops or Foundries* feature on the map for this year and so had no recorded used space. The *Merchandise and Miscellaneous Goods* industry included general merchandise shipped from

Washington this year as well as fertilizer, coal, and minerals. A numerical breakdown of each of these industries is given below in Table 11 (USACE 1896:1102).

Category	Product	Tons
Ag and Fishing	Cotton and Cotton Products	5,984.5
	Veg/Grain/Starch	10,672
	Livestock	87
	Fisheries Harvest	370
	Other	1,910.5
	Total	**19,024**
Lumber/Shingles/Turpentine	Lumber/Timber/Logs	107,714
	Shingles	2,638.5
	Naval Stores/Turpentine/Rosin	506.5
	Other	0
	Total	**110,859**
Machine Shops/Foundry	Machinery	0
	Iron Goods	0
	Hardware	0
	Other	0
	Total	**0**
Merchandise/Miscellaneous	Merchandise	12,291
	Raw Materials	10,900
	Construction Materials	0
	Fertilizer Products	30,000
	Oil Products	0
	Other	0
	Total	**53,191**

TABLE 11: The breakdown of production tonnage for each industry (USACE 1896:1102).

The USACE continued their work on improving the Tar-Pamlico River in 1896. As in previous years, this work included= the clearing of the river above and below Washington of logs, snags, trees, and stumps. A particular stump filled shoal below Washington is also mentioned. The cumulative work of the past two decades of clearing the river at this point resulted in a 200 foot wide and 7.5-foot-deep clear channel at Washington. No monetary commercial values were recorded for this year as well (USACE 1896:161-162). Table 12 gives the statistics for the in both 1896 and 2022 dollars, no total commerce in dollar data was reported for 1896.

	1896/2022 Dollars
River Improvement (Federally Expended)	3,296.40/110,330.51
Total Commerce	-

TABLE 12: Federally expended money and total commerce for 1896 (USACE 1896:161-162).

Although no shipbuilding was recorded for 1896, a total of 170 vessels plied the waters around Washington at various times of the year. These vessels had drafts of 3-8 feet and an aggregate net tonnage of 16,490.92. These vessel types included steamers and steam tugboats, barges, schooners, and sloops. It is not recorded where these vessels travelled to when not at Washington. Passenger data was likewise not reported for 1896 (USACE 1896:1103).

1901

Figure 19 below shows the reconstruction of Washington's 1901 waterfront. Continuing industrial growth is apparent, especially in the *Lumber, Shingles, and Turpentine* and *Agriculture and Fishing* industries. Lumber businesses in the southeast especially expanded and *Agriculture and Fishing* businesses take up a large portion of the waterfront. *Warehouses*, on the other hand, decreased drastically in waterfront space. Shifts are apparent in the *Transportation* sector as well. The railroad on the northwest side of town near the lumber mill has seemingly been demolished with only a small office remaining. However, the number of stables on the southeast side of town has increased significantly. The central waterfront's railway and associated buildings occupy a large portion of the central waterfront by this point and undoubtably played a major role in the transportation of waterfront goods stored in the warehouses and produced by the *Agriculture and Fishing* industries.

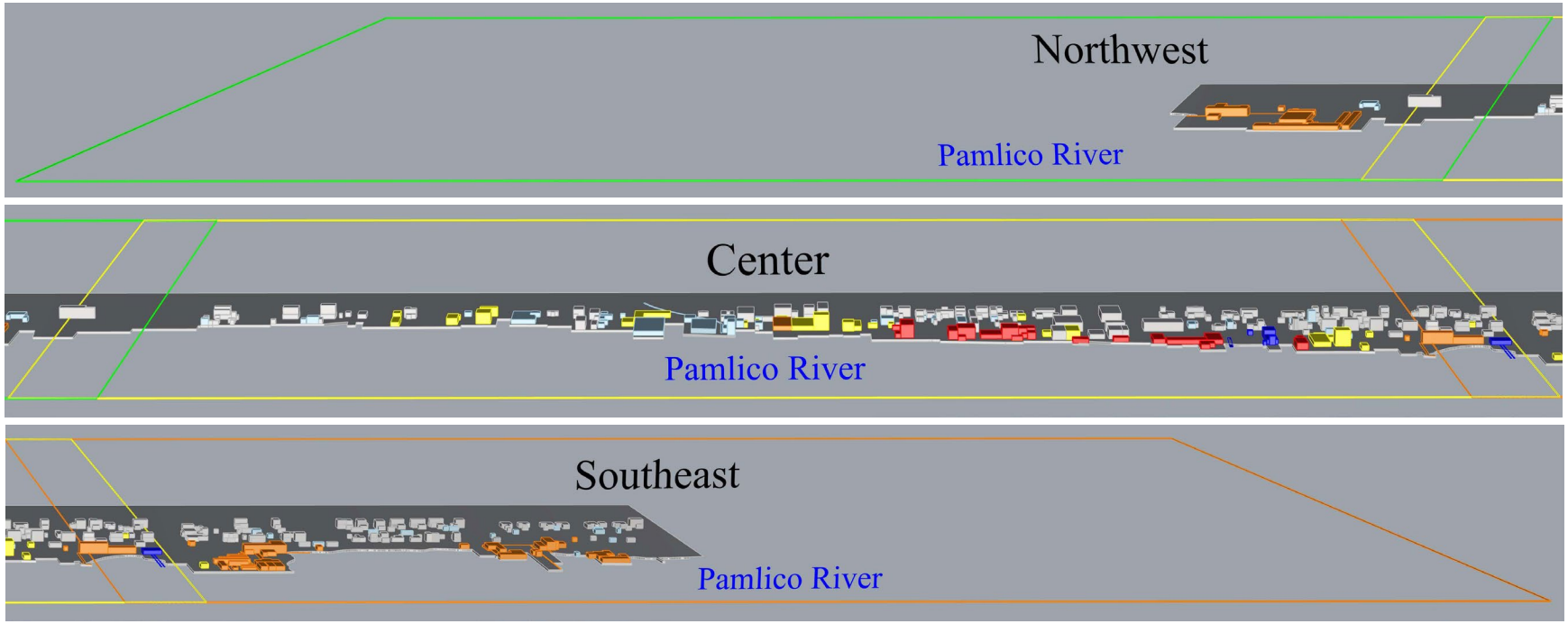


FIGURE 19: 3D model of Washington's waterfront in 1901, Sanborn-Perris Map Co. 1901 (Created by author, 2022).

This is the first year that the industries seem to have restructured along the waterfront according to typology. Each distinct industry has its own area along the waterfront. This is also the first year that the southeast portion of the waterfront has expanded this drastically. This area is primarily occupied by dwellings and stables which indicates the high level of movement and growth that the town is undergoing at this point.

Table 13 below shows the combined commercial statistics and square foot data for each waterfront industry. All commercial data is taken from the USACE Annual Report 1902.

Layer	Color	Tons	Area (Sq. Feet)
Ag. and Fishing		78,587.5	26,814.3
Lumber/Shingles/Turpentine		747,703.5	91,569.8
Warehouses		-	37,164.4
Transport		-	48,029.9
Shipyards		-	5,988.4
Town Buildings		-	138,673.3
Machine Shops/Foundry		1,166	-
Merchandise/Misc.		107,854.5	-
Total		935,311.5	348,240.1

TABLE 13: Industry color key with goods produced and total area occupied by that industry in 1901 (USACE 1902:1132).

As with the previous years, the list of goods produced and exported by Washington increased in 1901. Many more types of goods in the *Agriculture and Fishing* industry were reported during this year compared to the previous years. Cotton, cotton seed, cotton seed oil, cotton seed meal, cotton see hulls, and tobacco leaf were produced. Grains, hay, potatoes, peanuts, rough rice, vegetables, Cattle, horses, hogs, poultry, eggs, and hides were traded and shipped as well. Fish, oysters, and clams made up the aquatic harvest The *Lumber, Shingle, and Turpentine* industry, however, produced 9.5 times the tonnage of the agriculture and fishing industry. This included rosin, wood, timber, lumber, shingles, and tar and gum timber *Warehouses* stored some of these as well as other goods. *Transportation* included boathouses, stables, railroads, and railway stations. *Shipyards* occupied some space on the waterfront as well. *Town Buildings* includes dwellings, grocers, and other small businesses. While not occupying any space on the waterfront, *Machine Shops and Foundries* accounted for some production of goods. *Merchandise and Miscellaneous Goods* included general merchandise, fertilizer, coal and minerals, rafting gear, lime, shells, empty barrels, cabbage crates, pea baskets, junk, and truck (USACE 1902:1132). A

breakdown of the goods that make up each industry and the tonnage totals for each sector economy is given below in Table 14.

Category	Product	Tons
Ag and Fishing	Cotton and Cotton Products	25,409
	Veg/Grain/Starch	32,438.8
	Livestock	855.7
	Fisheries Harvest	16,504.4
	Other	3,178.5
	Total	**78,587.5**
Lumber/Shingles/Turpentine	Lumber/Timber/Logs	747,263,3
	Shingles	435.2
	Naval Stores/Turpentine/Rosin	5
	Other	0
	Total	**747,703.5**
Machine Shops/Foundry	Machinery	244
	Iron Goods	922
	Hardware	0
	Other	0
	Total	**1,166**
Merchandise/Miscellaneous	Merchandise	76,108
	Raw Materials	7,984
	Construction Materials	0
	Fertilizer Products	30,000
	Oil Products	0
	Other	0
	Total	**107,854.5**

TABLE 14: The breakdown of production tonnage for each industry (USACE 1902:1132).

The federal project of clearing the Tar and Pamlico River continued in the 1901 fiscal year. It involved dredging the channel of shoals both above and below Washington, as well as the removal of stumps, logs, and trees during the maintenance and improvement of the river. During 1901, $2,520.44 was spent on this improvement. Table 15 gives the statistics for the in both 1901 and 2022 dollars, no total commerce in dollar data was reported for 1901 (USACE 1901:301,1487).

	1901/2022 Dollars
River Improvement (Federally Expended)	2,520.44/83,366.67
Total Commerce	-

Table 15: Federally expended money and total commerce for 1901 (USACE 1901:301,1487).

While no shipbuilding was reported, 1 steamboat line was established, and it is reported that the steamboat line carried 13,293 passengers during the year. 126 vessels travelled through Washington during the year as well, including steamers, sloops, schooners, and barges for an aggregate net tonnage of 14,966. These vessels also ranged in draft from 2.5 feet to some of 9 feet (USACE 1902:1132).

1904

Figure 20 below shows the reconstruction of Washington's 1904 waterfront. Significant changes are noticeable from the 1901 map. Lumber processing expanded in the northwest. The *Agriculture and Fishing* businesses grew in the center of town alongside an increase in the *Town Buildings* of the area. The number of *Warehouses* grew slightly, however, there is a noticeable increase in the height of some of the warehouses. There was also a large boom in *Lumber, Shingles, and turpentine* industry in the southeast with a railroad supplying the lumber companies in both the northwest and southeast. *Machine Shops and Foundries* grew by a small margin as well. The railroad in the center of the waterfront continued to operate and do business with the central waterfront. Boathouses and stables along the central waterfront grew a small amount as well.

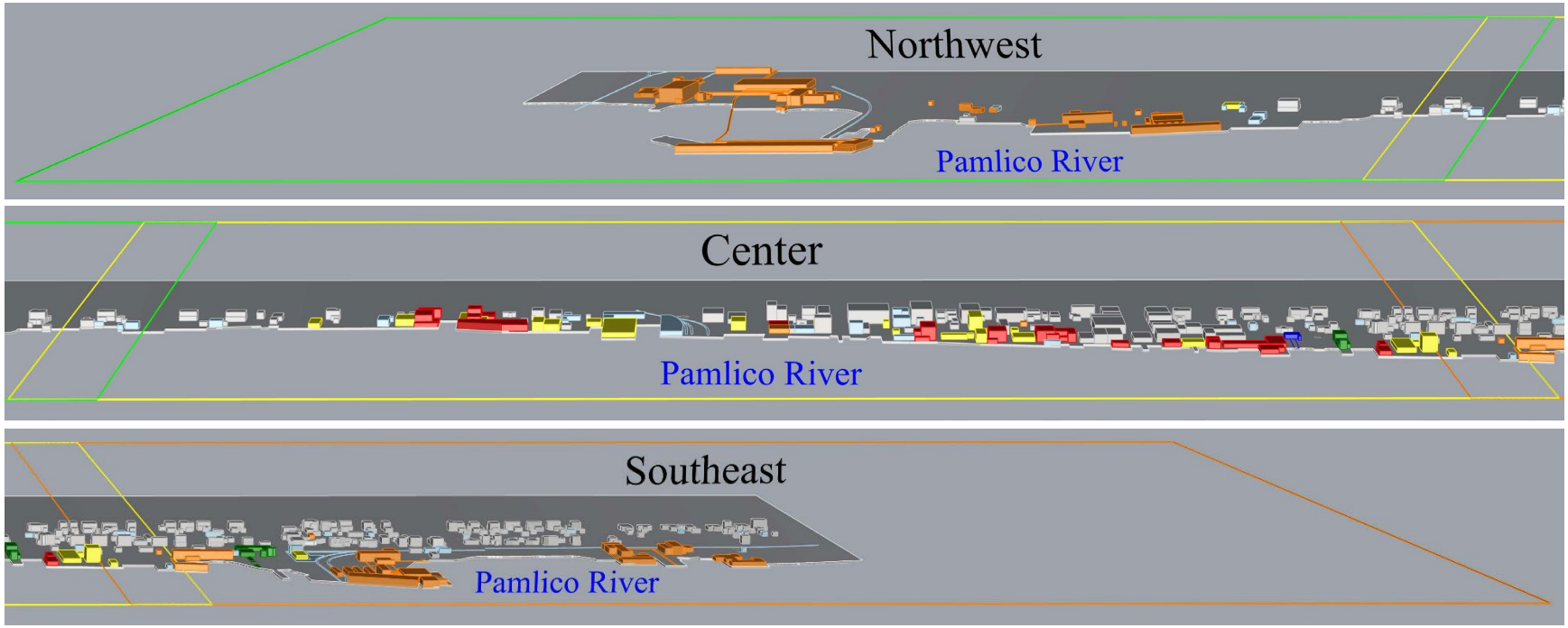


FIGURE 20: 3D model of Washington's waterfront in 1904, Sanborn Map Co. 1904 (Created by author, 2022).

Overall, the density of structures along the entire waterfront increased from the previous years. Connectivity is also noticeable with this year being the first where railroads are noticeably supplying the major waterfront industries of *Lumber, Shingles, and Turpentine,* on each end of the waterfront and *Agriculture and Fishing* in the center to town.

Table 16 below gives the overall commercial statistics and square foot areas for each industry on Washington's waterfront in 1904. All commercial statistics are gathered from the USACE 1905 Annual Report.

Layer	Color	Tons	Area (Sq. Feet)
Ag. and Fishing		53,486	54,805.1
Lumber/Shingles/Turpentine		401,730	195,145.8
Warehouses		-	56,946.2
Transport		-	70,688.8
Shipyards		-	2,345.1
Town Buildings		-	237,710.6
Machine Shops/Foundry		573	11,317.5
Merchandise/Misc.		58,549	-
Total		514,401	559,065.1

TABLE 16: Industry color key with goods produced and total area occupied by that industry in 1904 (USACE 1905:1205).

The *Agriculture and Fishing* industry remained a large portion of Washington's trade in 1904, accounting for 10.39% of trade by tonnage. It produced cotton, cotton seed, cotton seed oil, cotton meal, cotton seed hulls, tobacco leaf, rice, grains, hay, potatoes, vegetables, and peanuts. Cattle, horses, hogs, poultry, and eggs were also exchanged and shipped. The fisheries harvest comprised a large portion of the industry as well with fish, oysters, and clams all being gathered The *Lumber, Shingles, and Turpentine* industry was the largest producer of goods on the waterfront with 78.1% of the total tonnage. Wood, timber, lumber, shingles, and tar were all produced in these businesses. *Warehouses* held a variety of waterfront goods. *Transportation* included stables, boathouses, railroads, and railway stations, with some railroads supplying the waterfront as well as the lumber companies. *Shipyards* on the waterfront, while not producing any vessels in 1904, occupied a small area of the waterfront. *Town Buildings* include dwellings, offices, grocers, and other nondescript waterfront buildings. The *Machine Shops and Foundry* expanded this year and produced goods as well. The *Merchandise and Miscellaneous Goods* businesses of Washington produced merchandise, fertilizer, coal, minerals, rafting gear, lime,

shells, and brick (USACE 1905:1205). A breakdown of each industries largest production categories and their manufacturing statistics are given below in Table 17.

Category	Product	Tons
Ag and Fishing	Cotton and Cotton Products	26,910
	Veg/Grain/Starch	22,727
	Livestock	388
	Fisheries Harvest	783
	Other	2,778
	Total	**53,486**
Lumber/Shingles/Turpentine	Lumber/Timber/Logs	401,408
	Shingles	308
	Naval Stores/Turpentine/Rosin	14
	Other	0
	Total	**401,730**
Machine Shops/Foundry	Machinery	573
	Iron Goods	0
	Hardware	0
	Other	0
	Total	**573**
Merchandise/Miscellaneous	Merchandise	29,408
	Raw Materials	7,357
	Construction Materials	384
	Fertilizer Products	19,175
	Oil Products	0
	Other	12,658
	Total	**58,549**

TABLE 17: The breakdown of production tonnage for each industry (USACE 1905:1205).

The federal government allocated $21,628.51 to the improvement and maintenance of the Tar-Pamlico River above and below Washington for the 1904 fiscal year. This maintenance was consistent with the previous year's work. It included the dredging of the channel to a depth of 9 feet below Washington with the purpose of creating a navigable channel to the town. Stumps, trees, logs, and other snags were cleared by the hoister vessel *Trent*, while dredging work was done with the contracting of the dredge vessels *Albemarle* and *Scuppernong*. Both dredges worked on the improvement of the waterway directly adjacent to Washington's waterfront. The

report estimates that 44 percent of the work was completed by 1904. Table 18 gives the statistics for the in both 1904 and 2022 dollars, no total commerce in dollar data was reported for 1904.

	1904/2022 Dollars
River Improvement (Federally Expended)	21,628.51/683,237.34
Total Commerce	**-**

TABLE 18: Federally expended money and total commerce for 1904. (USACE 1904:231-232, 1479).

While no shipbuilding was reported for this year, plenty of vessels travelled through Washington. The total number of these vessels is 173 of varying classes including steamers, schooners, barges, and naphtha or small craft. Combined these craft had a net tonnage of 20,736 tons and drafts of between 2 and 8 feet. No transportation lines were established, however, 15,000 passengers utilized those already operating.

1911

Figure 21 below shows the reconstruction of Washington's 1911 waterfront. There are only a few differences from the 1904 reconstruction. The *Agriculture and Fishing* industry on the waterfront consolidated in buildings and decreased in area while the number of *Warehouses* grew slightly. The *Town Buildings* also appeared to grow. On the southeast side of the map, there is a now a large warehouse along the railway line. *Town Buildings* also have increased in both height and density of construction. On the southeast side of Washington, there is a now a large warehouse along the railway line which held a variety of goods shipped by the railway. Other than a slight expansion in buildings adjacent of the railway lines, there was not much change in the *Transportation* sector for this year.

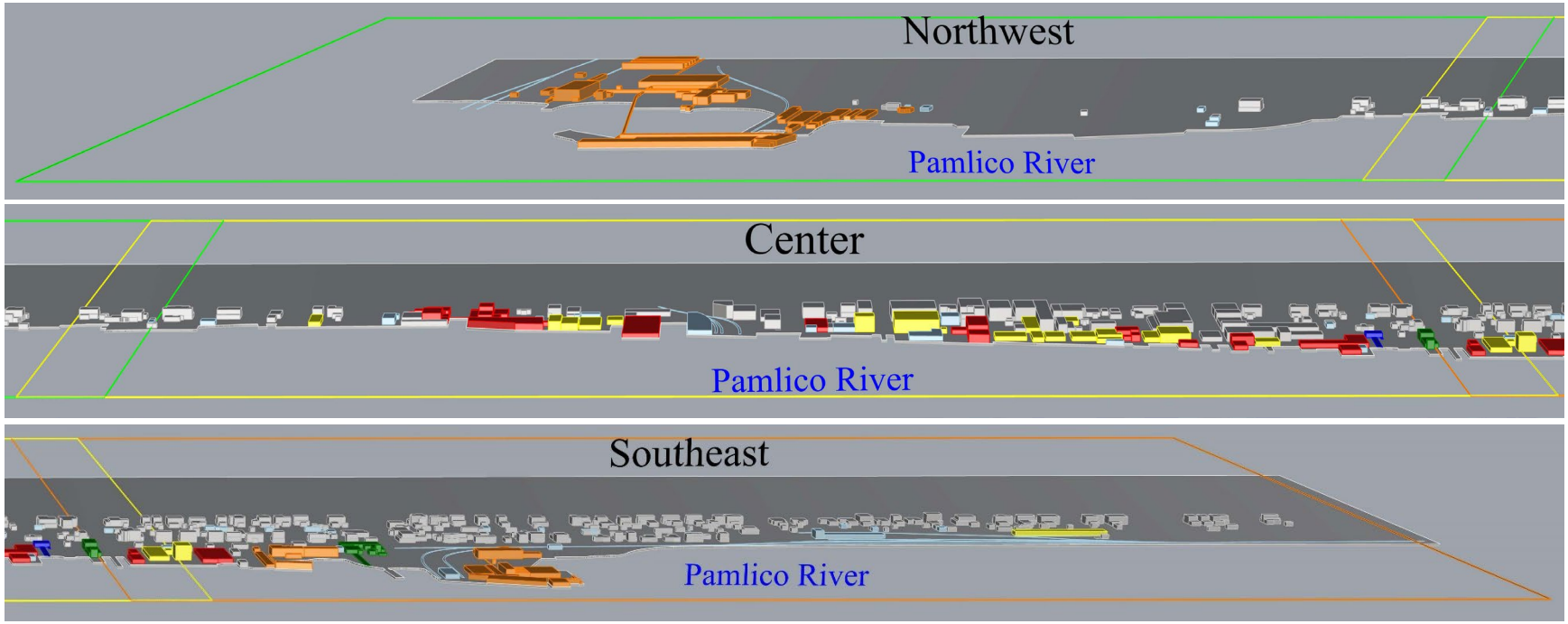


FIGURE 21: 3D model of Washington's waterfront in 1911, Sanborn Map Co. 1911 (Created by author, 2022).

One noticeable change from 1904 is in the *Lumber, Shingles, Turpentine* industry, the lumber mill on the furthermost southeast edge of the waterfront has gone out of business and is not recorded on the Sanborn maps by this time. The density of buildings continued to increase on the waterfront this year as well. Dwellings further expanded to the southeast of the waterfront past the railway line.

Table 19 below shows the total commercial production for each waterfront industry. All data was gathered from the 1911 and 1912 USACE Annual Report.

Layer	Color	Tons	Area (Sq. Feet)
Ag. and Fishing		30,244	98,424.6
Lumber/Shingles/Turpentine		247,029	183,164.3
Warehouses		-	74,806.3
Transport		-	98,744.5
Shipyards		-	3,019
Town Buildings		-	363,168.5
Machine Shops/Foundry		2,027	14,874.4
Merchandise/Misc.		59,269	-
Total		339,552	836,201.6

TABLE 19: Industry color key with goods produced and total area occupied by that industry in 1911 (USACE 1912:1740-1741).

Agriculture and Fishing accounted for 8.9% of Washington's production in 1911. This included cotton, cotton seed, cotton seed meal, cotton seed oil, cotton seed hull, grain, hay, potatoes, vegetables, and peanuts. Aquatic goods such as fish, clams, and oysters were also harvested. Cattle, horses, hogs, poultry, and eggs accounted for a smaller portion but were still produced (USACE 1912:1740-1741). The *Lumber, Shingles, and Turpentine* industry was prolific as well with 72.8% of total tonnage production. This industry manufactured lumber, shingles, timber, wood, and railroad crossties. Warehouses held a range of goods from merchandise to timber. The *Transportation* industry included stables, boathouses, railways, and railroad stations. Thought the reports indicate that no ships were built in 1911 however, a shipyard remained in operation on the waterfront (USACE 1912:1740-1741). *Town Buildings* made up 43.4% of the waterfront structures and included dwellings, grocers, general business, and other non-descript businesses. *Machine Shops and Foundries* produced machinery as well as railroad iron. *Merchandise and Miscellaneous Goods* included general merchandise, coal, fertilizer, oyster shells, ice, and brick (USACE 1912:1740-1741). A breakdown of each industry's 1911 production is given in Table 20 below.

Category	Product	Tons
Ag and Fishing	Cotton and Cotton Products	16,779
	Veg/Grain/Starch	7,564
	Livestock	314
	Fisheries Harvest	4,822
	Other	788
	Total	**30,244**
Lumber/Shingles/Turpentine	Lumber/Timber/Logs	246,197
	Shingles	313
	Naval Stores/Turpentine/Rosin	0
	Other	219
	Total	**247,029**
Machine Shops/Foundry	Machinery	286
	Iron Goods	1,741
	Hardware	0
	Other	0
	Total	**2,027**
Merchandise/Miscellaneous	Merchandise	13,615
	Raw Materials	4,468
	Construction Materials	180
	Fertilizer Products	39,196
	Oil Products	0
	Other	1,810
	Total	**59,269**

TABLE 20: Breakdown of production tonnage for each industry (USACE 1912:1740-1741).

The federal government continued the allocation of funds for the maintenance of the Pamlico River in 1911. This project was ongoing since 1876 and is stated as complete by 1911. A channel 100 feet wide and 9 feet deep at Washington had been successfully dredged by this time. The allocated funding was primarily for the maintenance of the river and channel. As with previous years, the river maintenance comprised of removing snags, stumps, logs, and trees that hampered riverine commerce. The government expenditure was dispersed to pay for wages, coal for the snag boat *Trent*, supplies, and subsistence (USACE 1911:354-356). Table 21 gives the statistics for the in both 1911 and 2022 dollars.

	1911/2022 Dollars
River Improvement (Federally Expended)	3,027.54/89,598.61
Total Commerce	6,950,513/205,697,139.89

TABLE 21: Federally expended money and total commerce for 1911 (USACE 1911:354-356).

The shipping industry continued to thrive during this period with 128 vessels travelling to and from Washington in 1911. These ships included sailing, steamer, gasoline, and unrigged vessels. Combined these vessels had a total aggregate registered tonnage of 20,124 tons and carried 2,100 passengers up and down the Tar-Pamlico River during the year (USACE Annual Report 1912:1740-1741).

1916

Figure 22 below shows the reconstruction of Washington's 1916 waterfront. The *Agriculture and Fishing* industry and *Warehouses* on the central waterfront began to disappear. However, the *Lumber, Shingles, and Turpentine* industry on either side of Washington were still present. One noticeable difference is that the buildings all along the waterfront grew in height. *Transportation* remains largely unchanged from the previous years with railroads in the northwest, center, and southeast of town. The number of stables, however, has taken a sharp decline and many have disappeared. A *Shipyard* is still present on the central waterfront. *Town Buildings,* however, continue to increase in number and density, especially on the central waterfront and the southeast. These are large and tall buildings that have started to overshadow the structures on the waterfront. One noticeable difference is that the buildings all along the waterfront are growing in height.

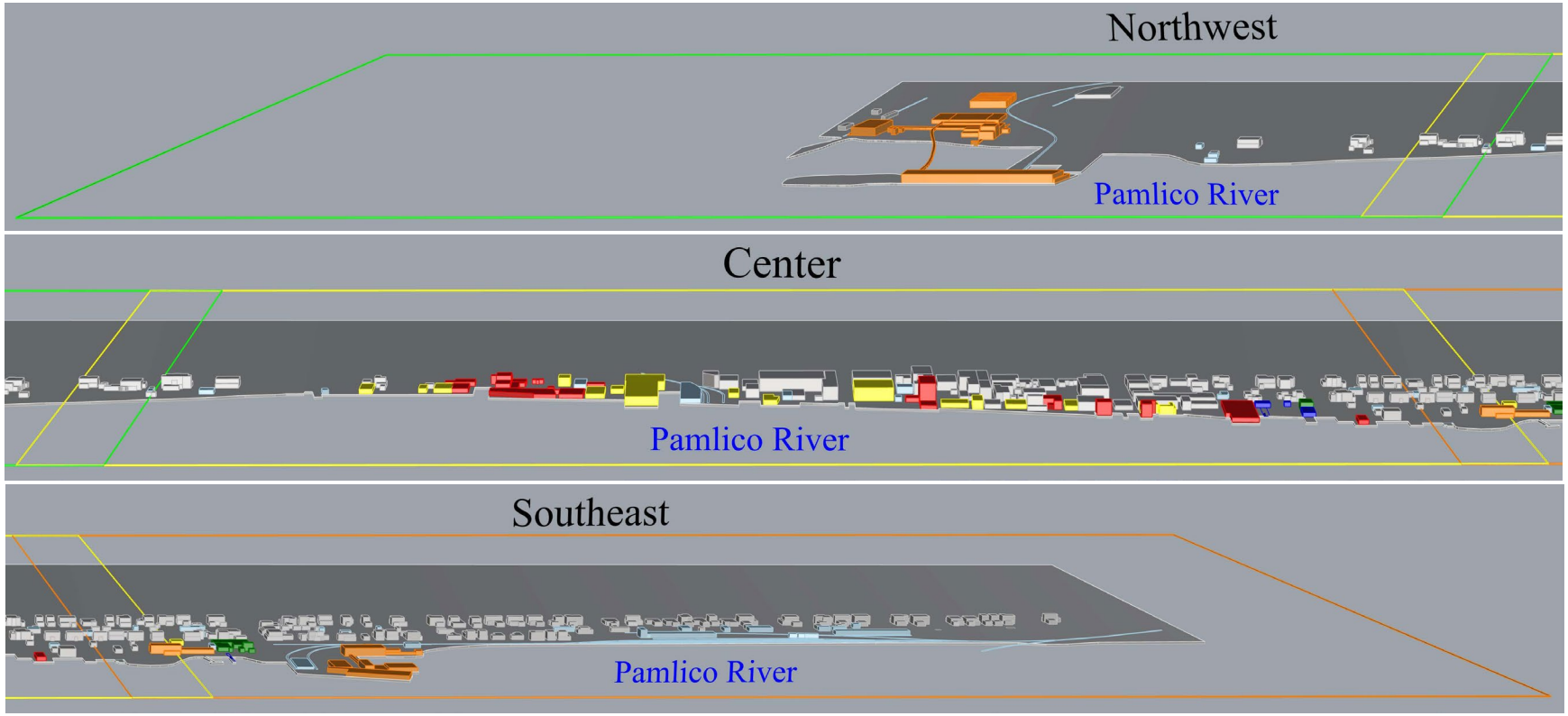


FIGURE 22: 3D model of Washington's waterfront in 1916, Sanborn Map Co. 1916 (Created by author 2022).

As mentioned above, the buildings along the waterfront have continued to grow in height. Most notably the *Agriculture and Fishing, warehouses,* and *Town Buildings* along the central waterfront. *Town Buildings* on the northeast and southwest side of town which consist primarily of dwellings are getting taller as well.

Table 22 below shows the total commercial statistics and the square footage for each industry. The data was gathered from the 1917 USACE Annual Report which has the commercial statistics for 1916.

Layer	Color	Tons	Area (Sq. Feet)
Ag. and Fishing		30,846	55,429.9
Lumber/Shingles/Turpentine		210,044	131,834.9
Warehouses		-	63,088.1
Transport		-	99,162.5
Shipyards		-	5,607.6
Town Buildings		-	333,578.8
Machine Shops/Foundry		1,136	9,466.8
Merchandise/Misc.		41,814	-
Total		283,840	698,168.6

TABLE 22: Industry color key with goods produced and total area occupied by that industry in 1916 (USACE 1917:2282-2283).

Agriculture and Fishing products accounted for 10.7% of Washington's trade in 1916. This trade included cotton, cotton seed oil, cotton seed, cotton seed hulls, cottons seed meal. Hay, dry goods, grains, Irish potatoes, sweet potatoes, peanuts, vegetables, watermelon, groceries, and tobacco made up the rest of the agriculture. Cattle, horses, hogs, poultry, and eggs accounted for the livestock products. Salted fish, fresh fish, clams, oysters, and oyster shells were harvested. The *Lumber, Shingles, and Turpentine* industry accounted for the largest export from Washington, with 74% of the total tonnage. Production included lumber, timber, railroad crossties, shingles, tar, and wood. Waterfront *Warehouses* held these goods and the other products that moved through Washington. *Transportation* included railways, railroad stations, boathouses, and stables, though the latter became less prominent during this time. No ships were recorded as being constructed in 1916 with the one shipyard still located on the waterfront. *Town Buildings* included dwellings, grocers, markets, and general businesses made up the largest portion of the town in square footage at 47.8% of the total waterfront area. The *Machine Shops and Foundry* produced machinery, railroad iron, and hardware (USACE 1917:2282-2283). For

the *Merchandise and Miscellaneous Goods* industry, there was no "catchall" general merchandise statistic for 1916. The only good listed that constitutes merchandise that cannot be applied to another category is furniture. There is, however, quite a lot of miscellaneous goods produced by Washington in this year. This includes bricks, cement, gravel, plaster, salt, coal, fertilizer, fertilizer materials, lime, and bulk lime, gasoline, bulk gasoline, kerosene, empty oil barrels, ice, soft drinks, and unspecified miscellaneous goods (USACE 1917:2282-2283). A breakdown of the categories of production for each industry is given in Table 23 below.

Category	**Product**	**Tons**
Ag and Fishing	Cotton and Cotton Products	12,345
	Veg/Grain/Starch	8,138
	Livestock	607
	Fisheries Harvest	5,924
	Other	3,357
	Total	**30,846**
Lumber/Shingles/Turpentine	Lumber/Timber/Logs	209,517
	Shingles	291
	Naval Stores/Turpentine/Rosin	75
	Other	81
	Total	**210,044**
Machine Shops/Foundry	Machinery	364
	Iron Goods	470
	Hardware	302
	Other	0
	Total	**1,136**
Merchandise/Miscellaneous	Merchandise	53
	Raw Materials	12,668
	Construction Materials	3,955
	Fertilizer Products	22,619
	Oil Products	873
	Other	1,941
	Total	**41,814**

TABLE 23: Breakdown of production tonnage for each industry (USACE 1917:2282-2283).

After decades of work, the improvement of the Pamlico River project which began in 1876 was completed in 1916. A channel 200 feet wide and 10 feet deep at low water was finished at Washington allowing for lower freight rates and increased economic potential for lesser draft vessels. This work, like the previous years, involved dredging of the channel to

increase width and depth as well as the removal of snags, logs, and stumps from the riverbed (UASCE 1916:542-545). Table 24 gives the statistics for the in both 1916 and 2022 dollars.

	1916/2022 Dollars
River Improvement (Federally Expended)	1,878.34/48,448.76
Total Commerce	4,309,521.40/111,157,185.56

TABLE 24: Federally expended money and total commerce for 1916 (USACE 1916:542-545).

It is worth noting that the report states that the character of commerce did not change due to the improvement. One new line was established, more timber was shipped by rail, greater demand for lumber increased price of lumber and fertilizer increased in price because of the First World War. It continued by mentioning that low value per ton commodities decreased while high value per ton commodities increased (USACE 1916:544).

The registered vessels that travelled through Washington included sailing ships, steamers, gasoline haulers, and barges which amounted to 132 total vessels with an aggregate net tonnage of 12,086 tons. The number of total passengers that travelled by ship from the waterfront was reported as approximately 10,000 people (USACE 1917:2283).

1924

Figure 23 below shows the reconstruction of the 1924 Washington waterfront. The *Agriculture and Fishing* businesses on the center waterfront continued to shrink in number along with the *Warehouses*. In the southeast, the large *Lumber, Shingle, and Turpentine* business disappeared while the railway was still operating. *Town Buildings* along the central waterfront continued to grow along with the dwellings on the northeast and southeast of the town. The *Machine Shop and Foundry* on the central waterfront was still operating along with the small *shipyard* in that area.

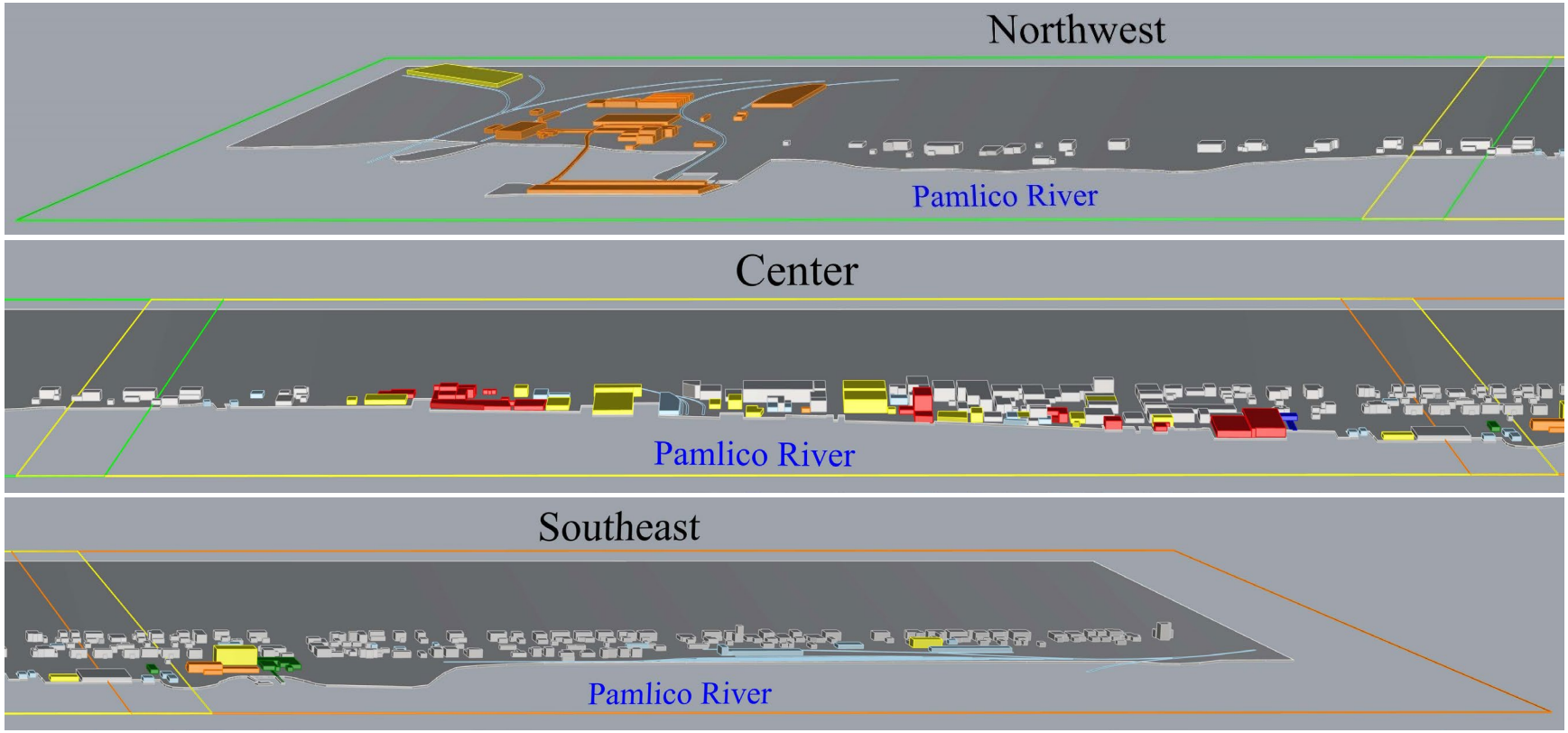


FIGURE 23: 3D model of Washington's waterfront in 1924, Sanborn Map Co. 1924 (Created by author 2022).

Many of the structures were built taller than in previous years including most of the *Town Buildings* which continue to expand. *Transportation* continued to operate with railroads on the northwest, center, and southeast of the waterfront. The stables at this time have been completely replaced by boathouses on the water and railroads.

Table 25 below gives the total commercial and square footage statistics for each in industry on the waterfront in 1924. All data is taken from the 1924 and 1925 USACE Annual Reports.

Layer	Color	Tons	Area (Sq. Feet)
Ag. and Fishing		19,428	82,712.9
Lumber/Shingles/Turpentine		102,783	168,663.3
Warehouses		-	146,530.8
Transport		-	134,275
Shipyards		-	3,137.3
Town Buildings		-	402,930.4
Machine Shops/Foundry		1,077	12,280.7
Merchandise/Misc.		41,205	-
Total		163,593	950,530.4

TABLE 25: Industry color key with goods produced and total area occupied by that industry in 1924 (USACE 1925:467-468).

The *Agriculture and Fishing* sector of Washington's economy produced much of the same goods as in the previous couple of years studied in this chapter. These goods included cotton, cotton seed, cotton seed meal, cotton seed hulls, dry goods, groceries, potatoes, vegetables, and watermelon, grain, hay, soft drinks, tobacco, and other vegetable products. Cattle and hogs, poultry and eggs were the livestock produced, while fish, fish scraps, oysters, and oyster shells accounted for the aquatic harvest The *Lumber, Shingles, and Turpentine* industry produced quite a lot more tonnage for this year than other sectors of Washington's economy at 63% the total tonnage production. This industry included lumber, timber, shingles, wood, laths, poles, and all other wood products. *Warehouses* stored these, and other assorted goods. *Transportation* in the town took the form of railroads, railway stations, boathouses, and parking lots became a staple in this year as well. *Town Buildings* consisted of dwellings, offices, grocers, markets, hotels, and various other unclassifiable businesses. The *Machine Shop and Foundry* produced machinery, hardware, sheet iron, and railroad iron. No general merchandise or goods that can be considered general merchandise was recorded as being produced in Washington for this year. The

Merchandise and Miscellaneous Goods industry made up the remainder of the total goods produced. These goods included brick, cement, coal, gasoline, kerosene, lubricating oil, salt, fertilizer, fertilizer material, ice made, unclassified miscellaneous goods, and other minerals (USACE 1925:467-468). The statistics for each one of the categories within each industry is listed below in Table 26.

Category	**Product**	**Tons**
Ag and Fishing	Cotton and Cotton Products	2,273
	Veg/Grain/Starch	4,117
	Livestock	387
	Fisheries Harvest	5,234
	Other	7,317
	Total	**19,428**
Lumber/Shingles/Turpentine	Lumber/Timber/Logs	102,061
	Shingles	107
	Naval Stores/Turpentine/Rosin	0
	Other	615
	Total	**102,783**
Machine Shops/Foundry	Machinery	260
	Iron Goods	527
	Hardware	290
	Other	0
	Total	**1,077**
Merchandise/Miscellaneous	Merchandise	0
	Raw Materials	453
	Construction Materials	3,503
	Fertilizer Products	33,066
	Oil Products	2,489
	Other	772
	Total	**41,205**

TABLE 26: Breakdown of production tonnage for each industry (UASCE 1925:467-468).

The river improvement project was completed in 1915, however, maintenance on the improvements was continued. As in previous years, maintenance involved the dredging and clearing of snags such as logs, trees, and stumps from the river. This work was primarily

undertaken by the U.S. dredge *Croatan* and the U.S derrick boat *Contentnea* (USACE 1924:522-524). The river federally expended river improvement statistics and the total commerce statistics are given below in Table 27, in both 1916 and 2022 dollars.

	1924/2022 Dollars
River Improvement (Federally Expended)	16,486.81/271,066.30
Total Commerce	6,227,447/102,387,968.96

TABLE 27: Federally expended money and total commerce for 1924 (USACE 1924:524).

Shipping was prolific during 1924 with many more vessels being recorded than any of the previous years combined. 750 steamers, 4,214 motor vessels, 415 sailing ships, and 33 barges are recorded as passing through Washington's waterfront. This amounted to an aggregate tonnage of 79,792 tons. It is also reported that 10 flats or lightboats were employed on the waterway to carry lumber, fertilizer, and logging supplies. The report also states that 2,000 passengers travelled either up or downstream on motor vessels. One shipping line was also abandoned this year. (USACE 1924:524, 1925:469).

1943

Figure 24 below shows the reconstruction of Washington's 1943 waterfront. The waterfront industries changed drastically between 1924 and 1943. While the lumber mill on the northwest side of the waterfront was still operating, the *Agriculture and Fishing* industry shrank to a handful of businesses. *Warehouses* are still present, but they are fewer in number. *Lumber, Shingles, and Turpentine* continued to have one large northwest mill and a small southeastern mill operating. *Town Buildings* expanded towards the waterfront and consolidated into larger structures.

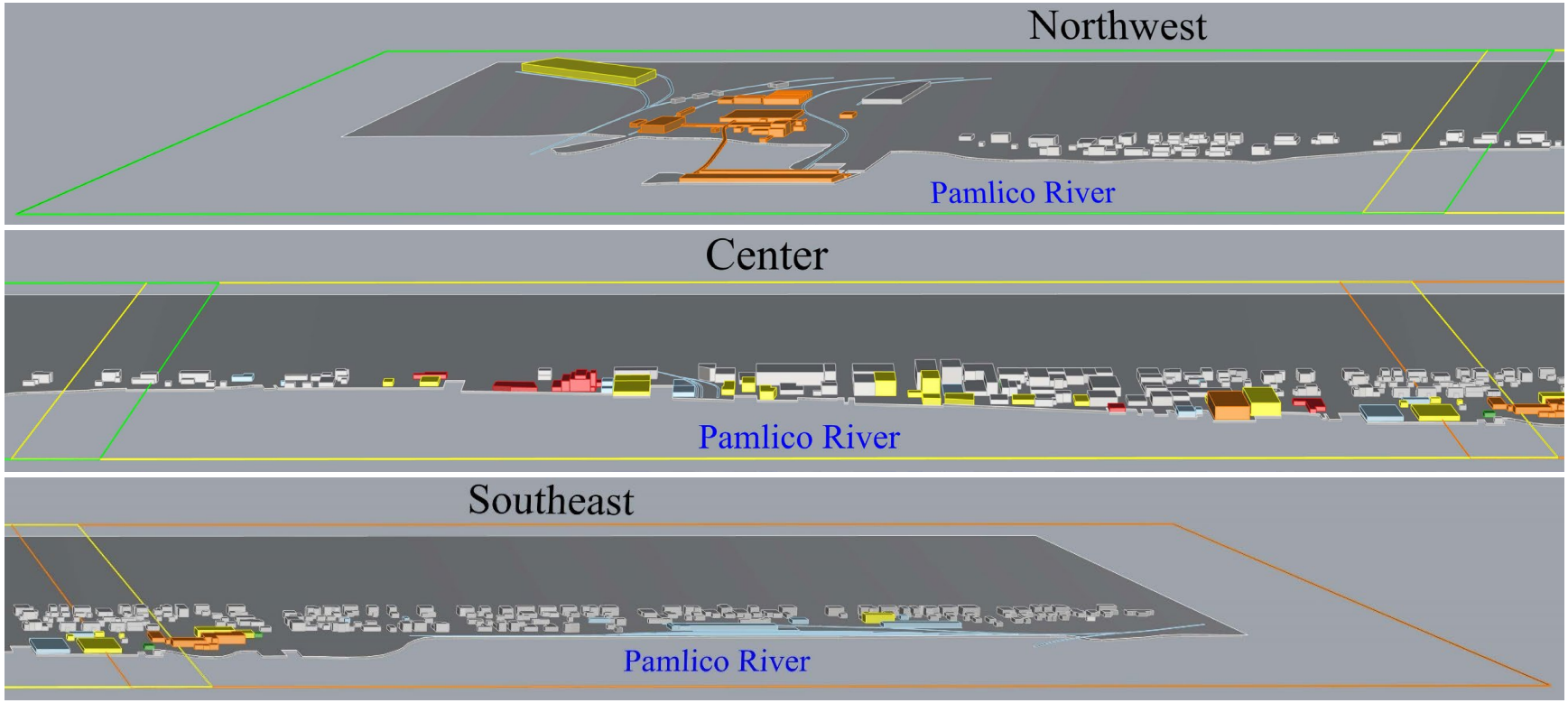


FIGURE 24: 3D model of the southeast view of Washington's waterfront in 1943, Sanborn Map Co. 1943 (Created by author, 2022).

Transportation remained an important facet of the waterfront with railroads still in the northwest, center, and southeast of town. One large difference is that by this time stables were fully replaced by gas stations and parking lots. It is clear that by this point the number of traditional industries along the waterfront has declined.

Table 28 below lists the aggregate tonnage production and square feet occupied by each industry on the waterfront. All data is taken from the 1943 and 1944 USACE Annual Reports.

Layer	Color	Tons	Area (Sq. Feet)
Ag. and Fishing		9,130	28,778.2
Lumber/Shingles/Turpentine		37,838	137,199.9
Warehouses		-	145,669.2
Transport		-	148,928.3
Shipyards		-	0
Town Buildings		-	434,961.8
Machine Shops/Foundry		1,107	1,815.5
Merchandise/Misc.		22,187	-
Total		70,259	897,352.9

TABLE 28: Industry color key with goods produced and total area occupied by that industry in 1943 (USACE 1944:496).

By 1943 the *Agriculture and Fishing* sector of Washington's economy had shifted. It was comprised of rice, corn, potatoes, dried beans and peas, coffee, tapioca flour, sugar, syrup and molasses, canned food products, dry goods, groceries, feed, and Coca Cola syrup. The aquatic harvest was comprised of hard crabs, oysters in a shell, and fresh fish. No livestock were recorded as being shipped from Washington in 1943The *Lumber, Shingles, and Turpentine* industry was the largest sector of Washington's economy during this year at 53.9% of total production but produced only a fraction of what it had in the previous years. It included rafted logs, pine lumber, shingles, paper stock, box shooks, and wood barrels. *Warehouses* were used to store Washington's goods. *Transportation* included boathouses, railways, railway stations, and parking lots while gas stations appeared as well. The *Shipyard* on the waterfront had been demolished or incorporated into another industry at this time; it did not produce any vessels or have any space on the waterfront *Town Buildings* included dwellings, offices, merchandise proprietors, markets, grocers, hotels, and a variety of other unclassifiable buildings. The *Machine Shop and Foundry* produced structural steel, bottle caps, iron and steel drums, and hardware. *Merchandise and Miscellaneous Goods* was composed of drugs, baking soda, vinegar, and

merchandise, gasoline, kerosene, paints in oil, fuel oil, lubricating oil, brick, cement, fertilizers, chlorine gas, and anthracite coal (USACE 1943:496). A breakdown of the tonnage produced by each category of goods for each industry is listed below in Table 29.

Category	**Product**	**Tons**
Ag and Fishing	Cotton and Cotton Products	0
	Veg/Grain/Starch	208
	Livestock	0
	Fisheries Harvest	1,072
	Other	8,110
	Total	**9,130**
Lumber/Shingles/Turpentine	Lumber/Timber/Logs	37,580
	Shingles	66
	Naval Stores/Turpentine/Rosin	0
	Other	189
	Total	**37,838**
Machine Shops/Foundry	Machinery	0
	Iron Goods	0
	Hardware	363
	Other	744
	Total	**1,107**
Merchandise/Miscellaneous	Merchandise	700
	Raw Materials	246
	Construction Materials	441
	Fertilizer Products	5,744
	Oil Products	14,990
	Other	66
	Total	**22,187**

Table 29: Breakdown of production tonnage for each industry (USACE 1944:496).

In the intervening years between 1924 and 1943, the Pamlico River improvement project was expanded to a 12-foot depth and 200-foot-wide channel at mean low water tide at Washington. This project was completed in 1939 so for 1943, only maintenance including dredging and clearing of snags occurred. It is also noted in the report that at this time there were 34 wharves on Washington's waterfront with a frontage of 3,570 feet and the other existing facilities were considered adequate for existing commerce (USACE 1943:428). Statistics for the

federally expended funds and total commerce is given below in Table 30 in both 1943 and 2022 dollars; no total commerce in dollar data was reported for 1943.

	1943/2022 Dollars
River Improvement (Federally Expended)	28,866.38/469,117.05
Total Commerce	**-**

TABLE 30: Federally expended money and total commerce for 1943 (USACE 1943:428).

Ship travel included vessels with drafts that varied from 2 to 11 feet. This included motor vessels, sailing vessels, barges, and tugs totaling 3,198 vessels that travelled through Washington in 1943. They had a total net tonnage of 95,721 tons and carried 600 passengers during the year (USACE 1944:496).

Conclusion

This data is used in chapter 6 to engage in diachronic analysis (i.e., an examination of change through time) of Washington's waterfront commerce. All nine periods of study are compared using statistics and graphs to determine the answers to the proposed research questions listed earlier in this thesis. The analysis of all this data will help shed light on the how all the industries on the waterfront evolved during the roughly six decades covered by this study.

CHAPTER 6: ECONOMIC AND VISUALIZATION ANALYSIS OF WASHINGTON'S WATERFRONT INDUSTRIES

Introduction

This chapter synthesizes the results data presented in Chapter 5 for a diachronic analysis of Washington's waterfront commerce. This is a multi-part analysis that investigates the commercial development and decline of the waterfront, the square footage increases and decreases of industries, and the infusion of federal funds to improve the Pamlico River channel. A visualization of the expansion and contraction of the waterfront will also be conducted which will show the waterfront change for the *Agriculture and Fishing* and *Lumber, Shingle, Turpentine* industries. These are the two largest industries on the waterfront and are emblematic of its development. Line graphs and bar graphs communicate possible points in time that represent the divergences or continuities between trade, construction on the waterfront, and possible explanations of the effects of waterfront changes.

All these individual analyses are intertwined with the history and theories of port development discussed earlier in this research to create a full picture of the waterfront evolution. Washington's commerce is examined first. This includes the individual assessment of the *Agriculture and Fishing* industry, *Lumber, Shingles, Turpentine* industry, *Machine Shops and Foundry* industry, and the *Merchandise and Miscellaneous* industry. Total commerce compared to square footage and total commerce compared to river improvement follow the individual industry commercial analysis. This approach allows for the quantifiable and measurable determination of what happened to individual industries on the waterfront and is followed by an understanding of the overall trends of Washington's waterfront development.

Waterfront Industry Analysis

This section deals with the commercial analysis of Washington between 1885 and 1943. It begins with a discussion of individual industries and their respective produced goods. That data is then used to analyze total waterfront commerce. The graphs used in this chapter cover the decades between 1880 and 1950, analyzing the individual years defined by Sanborn maps and commercial statistics communicated in the previous chapter. This evaluation is meant to be an economic analysis of Washington's waterfront production. While extenuating circumstances such as weather variations or even conflict (i.e., World Wars at the time of the 1916 and 1943 datasets), influenced the economy and production, those variables cannot be accounted for with the data available, so definite conclusions about the effects of those events will not be drawn.

Agriculture and Fishing

Figure 25 visualizes the statistics for the *Agriculture and Fishing* industry of Washington between 1885 and 1943. Four types of goods within this overall industry represent the four largest categories of agricultural and fishing goods: Cotton and Cotton Products are denoted with a red line; Vegetables, Grains, and Starch are gold colored; Livestock is a dark red line; and Fisheries Harvest is a dark blue line. The grey line represents the 'Other' category of goods. This graph shows the distribution of goods production over time. Some trends are initially quite striking, as there is a massive increase in production for the first few years of the study. This culminates around the turn of the century, followed closely by a sudden and sharp decrease in production, and no recovery.

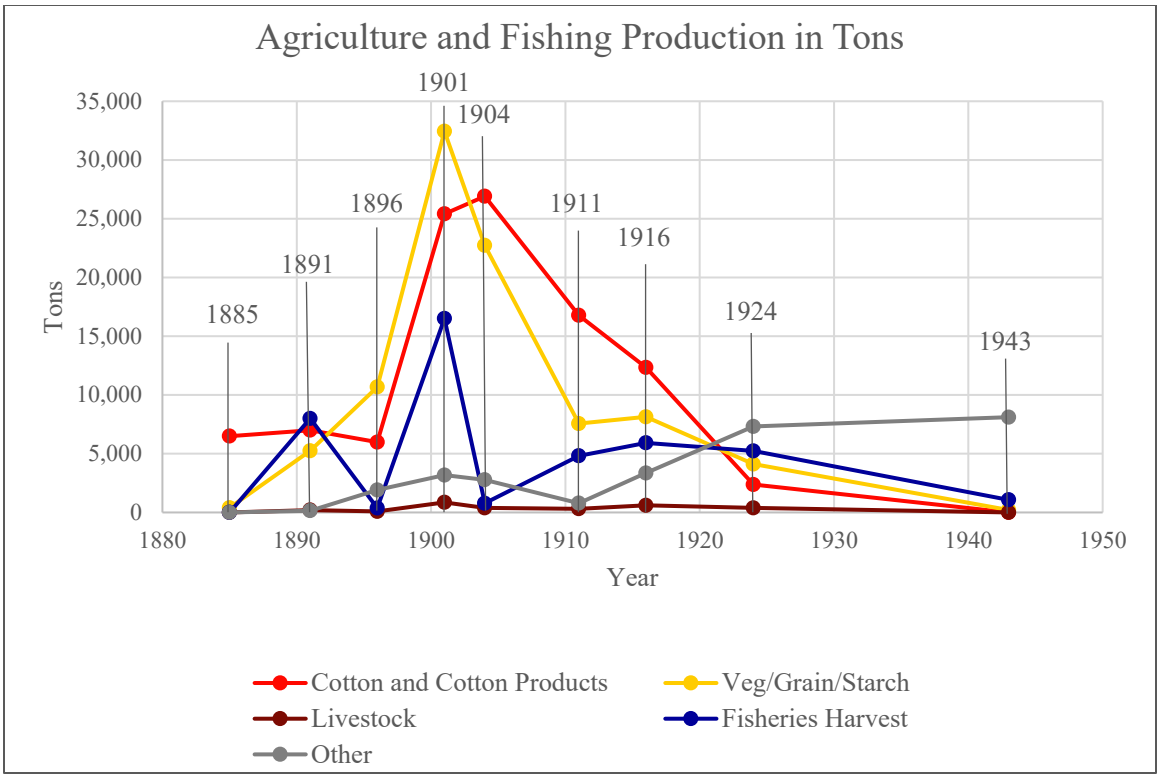


FIGURE 25: Line graph for *Agriculture and Fishing* Statistics in tons of goods produced for the studied years (Created by author 2022).

The *Agriculture and Fishing* industry was an important facet of Washington's waterfront commerce and is a good indicator of the overall health and evolution of the waterfront. Figure 25 roughly mirrors the timeline Gordon Jackson (1983) argues for in his morphological approach to port development. He asserts that the height of regional port prosperity lasted from 1870 to 1914, while stagnation and decline happened from 1919 onwards. Washington's Agriculture and Fishing industry appears to have undergone that same process in time. The height of prosperity was reached at the beginning of the 20th century, followed by a decline. This may have been due to the technological changes that helped regional ports initially, but then caused their collapse by outclassing and superseding the waterfront systems (Jackson 1983:47).

While technological innovations such as railroads may be responsible to an extent, national trends also need to be consulted to gain a larger perspective of production rates of

goods. Cotton production through the United States generally increased from 1880 until 1914, after which production rates dropped until 1925, when a resurgence occurred that was then followed by even lower rates until 1945. Hay, however, remained at relatively constant production levels throughout 1885 to 1943 (United States Department of Commerce [USDC] 1949:108). Wheat and corn underwent yearly fluctuations and peaked in 1915 followed by a small decrease but remained at stable production afterwards (USDC 1949:106). Cattle production gradually increased year to year as well during this period (USDC 1949:102). All these data points, apart from cotton, exemplify that Washington's waterfront decrease of agricultural production was not due to larger trends in the United States. Decreases in cotton production may have been affected by these trends, but the other goods were affected by changes in Washington's waterfront or regional developments.

Figure 26 is a stacked bar graph that represents the overall percentages of each category of goods and how much of the overall percentage of production they represent for each year of study. The N underneath each bar denotes the sample size for each year which is the total tonnage produced by the *Agriculture and Fishing* industry for that year. Cotton and cotton products represented a large proportion of the agriculture and fishing industry of Washington through the years. Production increased dramatically in 1901 and further in 1904. After 1904 production rates rapidly decreased. The decrease accelerated afterwards and by 1943 there was no cotton or cotton products being produced in Washington.

There was a rapid growth of vegetables, grains, and starches from 1885 to 1896. They expanded their market share, growing from less than 10 percent to over 25 percent of the *Agriculture and Fishing* industry. Like cotton, there was a corresponding rapid increase in the tonnage production of these goods in 1901, but a decrease in their overall market share. By 1911,

only a fraction of the 1901 tonnage was being produced, however, and its market share contracted from the previous years. By 1943 that number had further decreased, and it controlled no meaningful portion of the market.

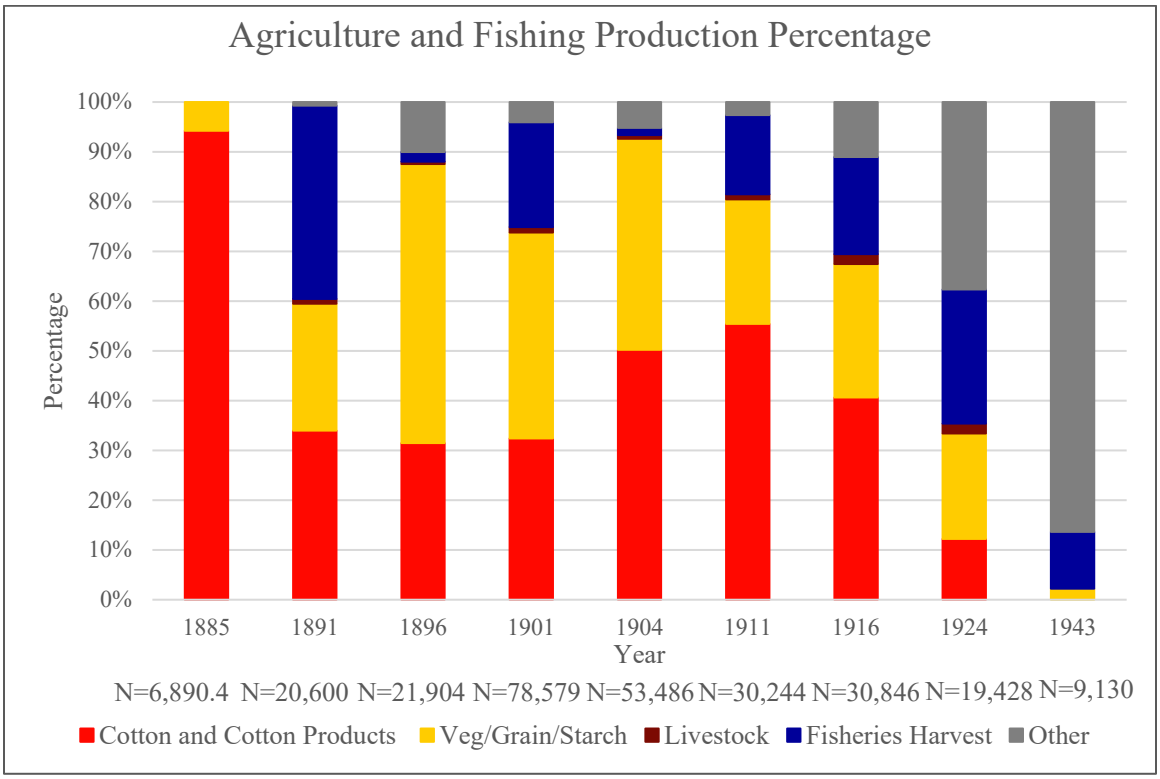


FIGURE 26: Bar graph depicting the percentage each category of goods produced for each year (Created by author 2022).

The livestock sector remained small throughout all the years studied. It seems to have generally followed the larger patterns of increase to 1901, followed by a lasting decline. The fisheries harvest classification is more variable than the other types of agricultural products. There was a substantial increase from 1885 to 1891 followed by a decline in 1896. These production contractions coincide with corresponding decreases in the overall market share, as the production rates of the other categories remains consistent compared to the fluctuations in the aquatic harvesting. 1896 was followed by another large increase in 1901 and a sharp decrease in 1904. During the next decade and a half, the production values appear to have stabilized, with

slightly increasing proportion of the market share. The expansion during the first and second decade of the 20th century ended by 1943 when only a small fraction of fishing goods were produced.

For 1885, the production of other goods was zero. From 1891 to 1901 there was a steady increase and by 1901 a high was reached, however, this value decreased over the next decade. By 1904 production was down and this number further dropped in 1911. From 1885 to 1911, the market share remained relatively consistent. By 1916 this trend reversed, and production numbers and market share rose. Further increases in production were apparent by 1924. The goods in this category shifted dramatically between 1924 and 1943. By 1943, corn, dried peas and beans, coffee, tapioca flour, sugar, syrup, molasses, coca cola syrup, canned food products, groceries, feed were being produced, rather than the traditional hay and tobacco. These new goods took up around 85 percent of the agriculture and fishing market as well. This solidified a shift in production that began in the early 1920s and is apparent with a decrease in shipping of cotton and vegetable products.

The trends described above, show a few interesting points of inflection. The first is in 1891, when the industry truly diversified and produced all the different types of goods. The second point is in 1901 when the production of all goods skyrocketed and reached a peak that was far above all other production values. The third and final point of deviation appeared during the mid-1920s and is obvious by 1943. This third point represents the time where new types of goods were being produced by the *Agriculture and Fishing* industry. These included canned products, syrup, molasses, and coca cola syrup replaced cotton, grains, vegetables, starches, livestock, and fisheries harvest. A visualization of this change is shown below in Figures 27-30.

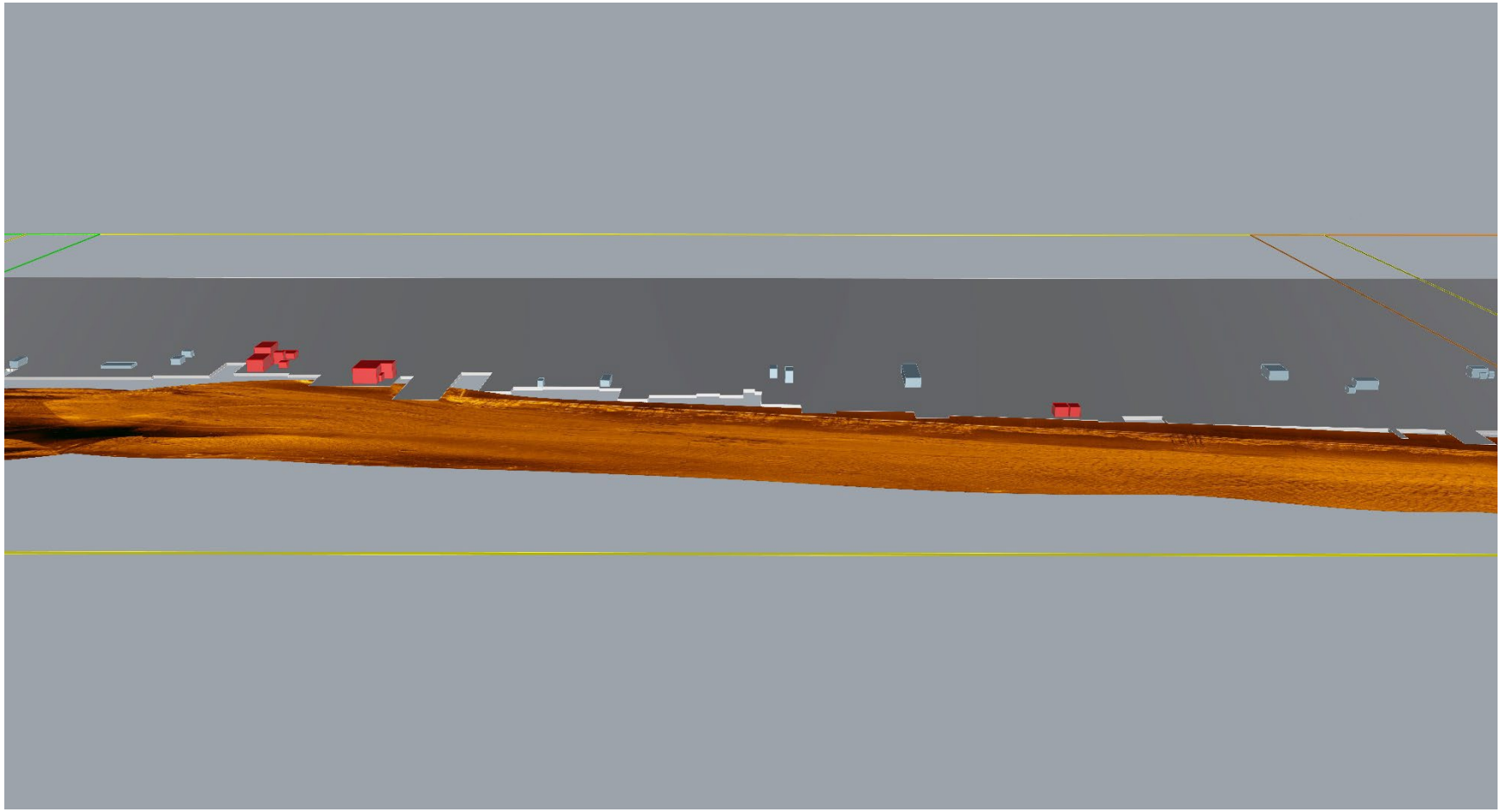


FIGURE 27: Close up view of the sonar data overlayed on the 1885 reconstruction showing the *Transportation* (light blue) and *Agriculture and Fishing* (red) layers (Courtesy of the author).

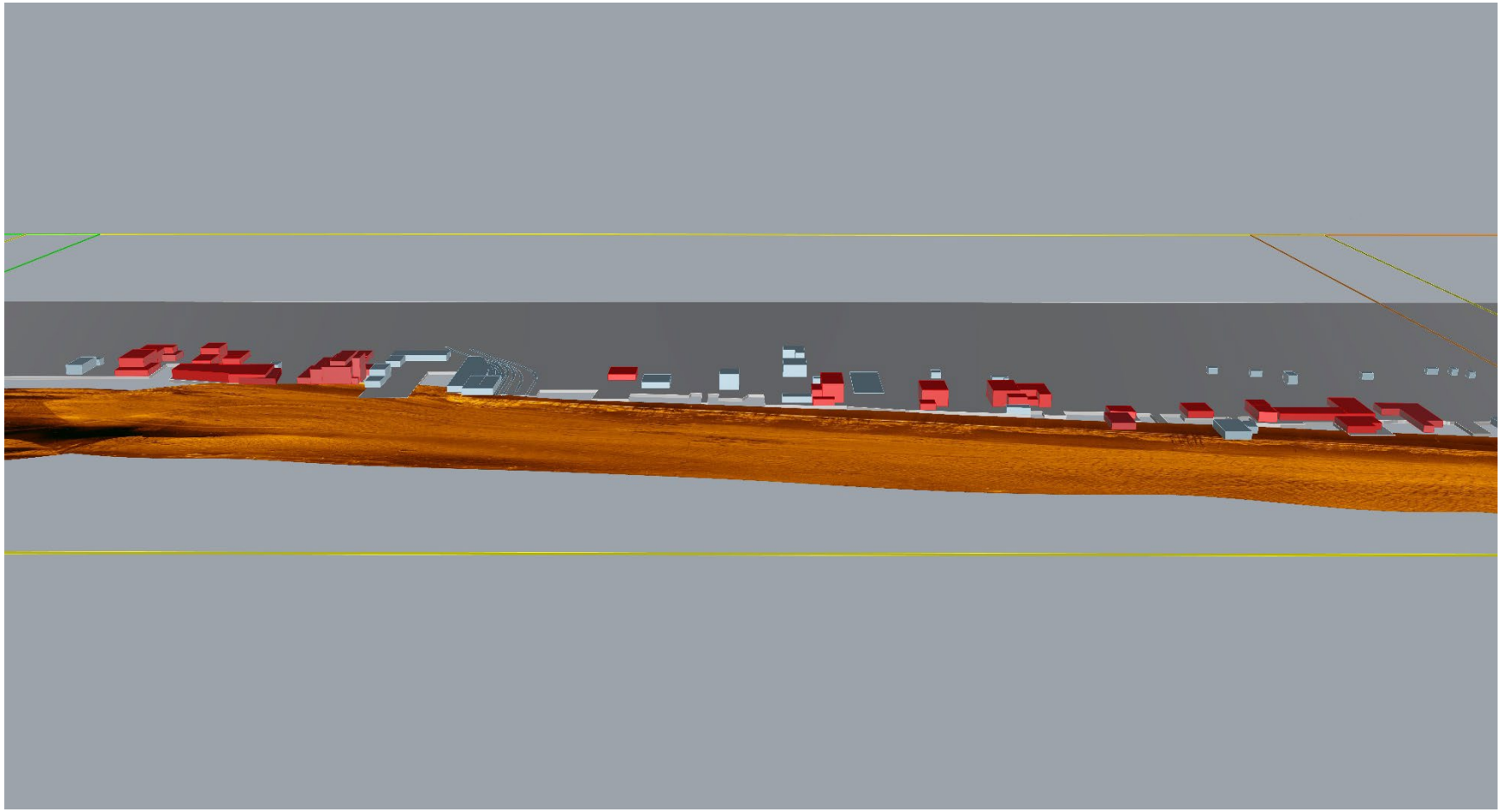


FIGURE 28: Close up view of the sonar data overlayed on the 1904 reconstruction showing the *Transportation* (light blue) and *Agriculture and Fishing* (red) layers (Courtesy of the author).

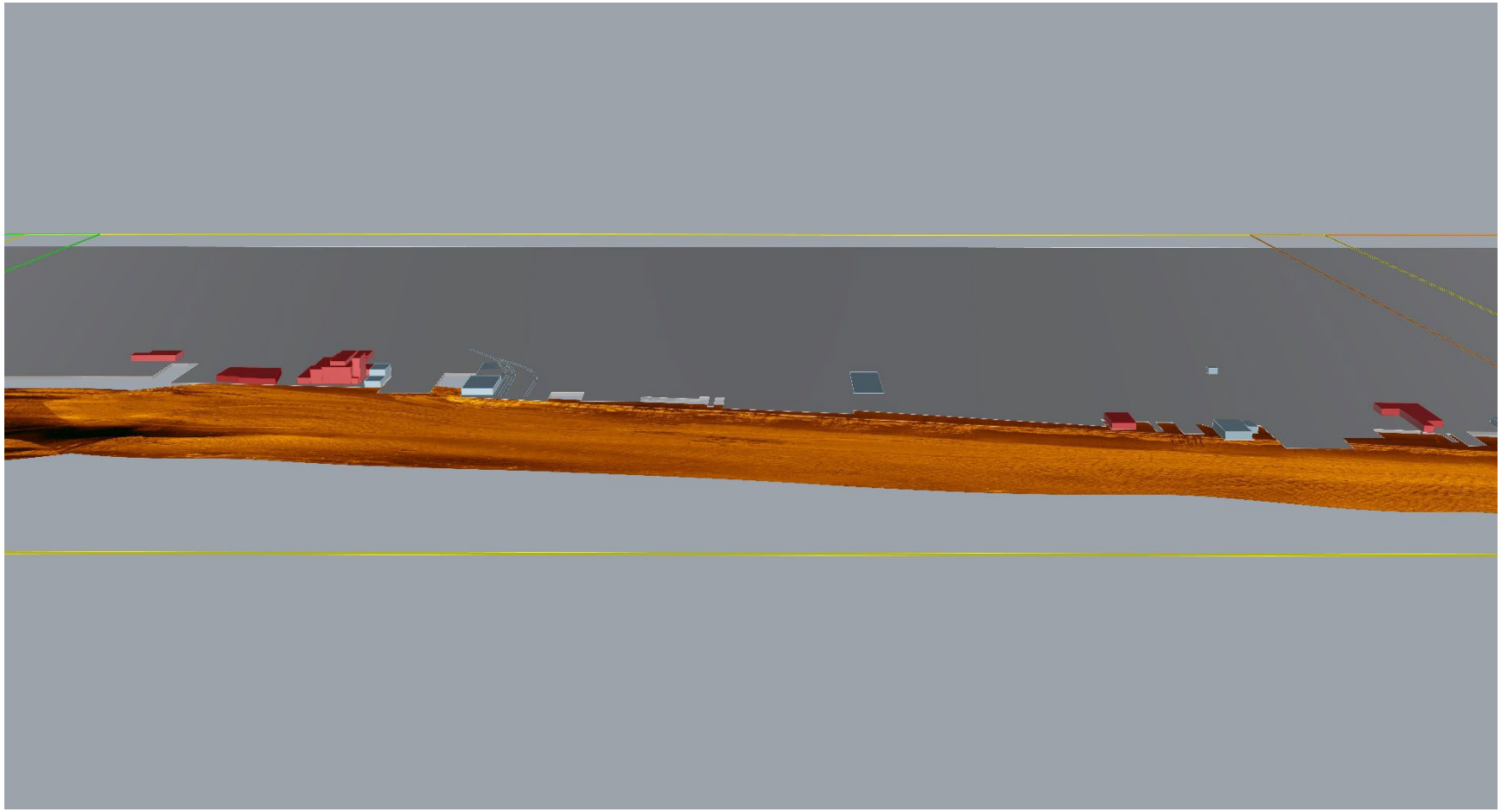


FIGURE 29: Close up view of the sonar data overlayed on the 1943 reconstruction showing the *Transportation* (light blue) and *Agriculture and Fishing* (red) layers (Courtesy of the author).

The replacement of these goods cannot be applied to shifts in larger national economic trends as mentioned above. Cotton values varied and slowly decreased but all other goods were either steady or increased. The waterfront's *Agriculture and Fishing* industry appeared to follow the rise and height of prosperity which occurred between 1891 and 1901. This also represents the greatest diversification between the traditional *Agriculture and Fishing* goods before they were supplanted by new products that may not have been as integral to waterfront trade as the traditional goods. Overall, the national statistics show that these decreases were not on a national level, rather, they were on a regional or solely local level. These goods also follow the timeline and trends argued by Jackson (1983) in which a height of prosperity around the turn of the 20th century was reached, followed by a sustained decline due to technological innovations such as railroads that collapsed most port systems (Jackson 1983:47).

This can be seen as a visualization in the above figures. The *Agriculture and Fishing* industry is turned on with the *Transportation* layer to show the growth of each in a side-by-side comparison. *Agriculture and Fishing* can be seen growing from 1885 to an impressive number of buildings in 1904, the cotton production high, to an equally impressive decline to 1943. *Transportation* increases from stables in 1885 to stables and railroads in 1904 to railroads and parking lots in 1943. This shows an incredible amount of growth and technological innovation in a relatively short amount of time. While *Agriculture and Fishing* declines, *Transportation* increases and technologically innovates. The *Transportation* sector may have initially grown to support the *Agriculture and Fishing* industry; however, it was not reliant on the former for continued growth and development and very well may have taken business away from the waterfront. This is a further example of the changes in good production described previously and it supports the technological innovation argument espoused by Jackson (1983). Further

investigation of other waterfront industries is necessary to determine if this process was isolated with the *Agriculture and Fishing* industry or appears in other sectors of the waterfront economy.

The sonar data and reconstruction present an opportunity for further archaeological data gathering on any of the industries on the waterfront. As is visible in the imagery, the historical waterfront is located inland of the current waterfront so there are no discernable archaeological remains on the riverbed. The overlay of the reconstruction, however, may be able to act as a predictive archaeological model to get a rough estimation of where in situ archaeological remains may be located. The area around the railroad station is of particular interest and may hold the remains of the large industrial structures in that vicinity.

Lumber, Shingles, and Turpentine

This section discusses the analysis of the *Lumber, Shingles, and Turpentine* industry of Washington. The production values for each year are shown in Figure 30. This industry is comprised of four distinct categories: lumber, timber, and logs is denoted by an orange line; shingles with a red line; naval stores, turpentine, tar, and rosin is a light blue line; other goods are colored with a gray line. The *Lumber, Shingles, and Turpentine* industrial output roughly mirror that of the *Agriculture and Fishing* industry. Drastic increases of shingles in 1896 and of lumber in 1901 were followed by corresponding decreases in production capacity. Naval stores and turpentine followed a similar, but earlier pattern. They increased drastically in 1896 but fell sharply to almost no production value by 1901. Other goods saw an increase in 1924, however, that too was followed by a sharp decrease.

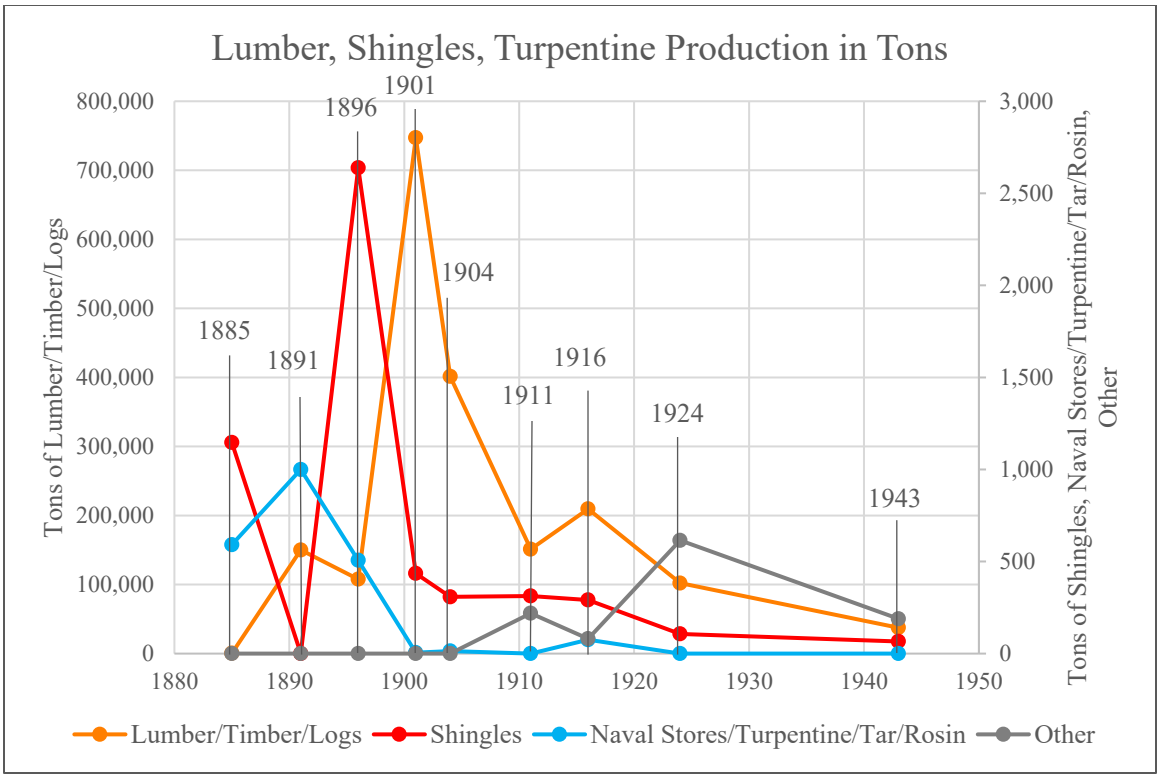


FIGURE 30: Line graph for *Lumber, Shingles, and Turpentine* production statistics for Washington (Created by author 2022).

One distinction to make, is that production of lumber, timber, and logs was far more in tonnage than the other categories within this and all other industries on Washington's waterfront. These goods are measured in hundreds of thousands of tons rather than in thousands or hundreds of tons. This industry was by far the largest on the waterfront and relied on it for transportation and storage of large lumber. The rise and fall of the lumber industry can be directly correlated with the rise and fall of the industrial waterfront.

Gordan Jackson (1983) argues that technological changes hampered the development of ports in the early 20th century and aided in their systematic collapse. The *Lumber, Shingles, and Turpentine* industry exemplifies this theoretical perspective. The height of production occurred for the three traditional categories from 1891 to 1901 which represents the height of prosperity argued by Jackson. This period was in turn followed by one of decline in those traditional

industries which saw the production of some of the categories such as lumber, drop by as much as 95% and be supplanted by 'other' industries.

The data from this industry also supports Hoyle and Hilling's (1984) geographic-spatial assertions regarding regional ports. A port's location and connectivity to the regional hinterlands and wider maritime trade routes determines the survival potential of regional ports. The main export of the port of Washington throughout this entire period was large cut lumber and timber. This was supplied by upriver pine forests which drew initial investment into the town and its geographic position was strategically located in between the pine forests and the wider trade routes reaching into the Atlantic. This began to change, however, as the river adjacent pine forests were cut down and the lumber companies moved operations inland. By 1918 this process had been solidified with the lumber companies increasingly shipping their lumber to and from Washington using railroads because waterborne transportation was inefficient and unprofitable (USACE 1918:591). The geographic position of the waterfront was unimportant by the early 20th century for the largest industry on it, which undoubtably played a large part in the overall decline and decrease of importance on the entire waterfront.

Figure 31 shows the percentages of each one of the categories of goods within the *Lumber, Shingle, and Turpentine* industry of Washington for each year in this research. N underneath each bar represents the tonnage production for each year; the lumber and associated products category was by far the largest producer of goods and raw materials for Washington after 1885. Shingles and turpentine were large producers in 1885, but shingles and turpentine decreased in production capacity and percentages while large scale lumber increased drastically.

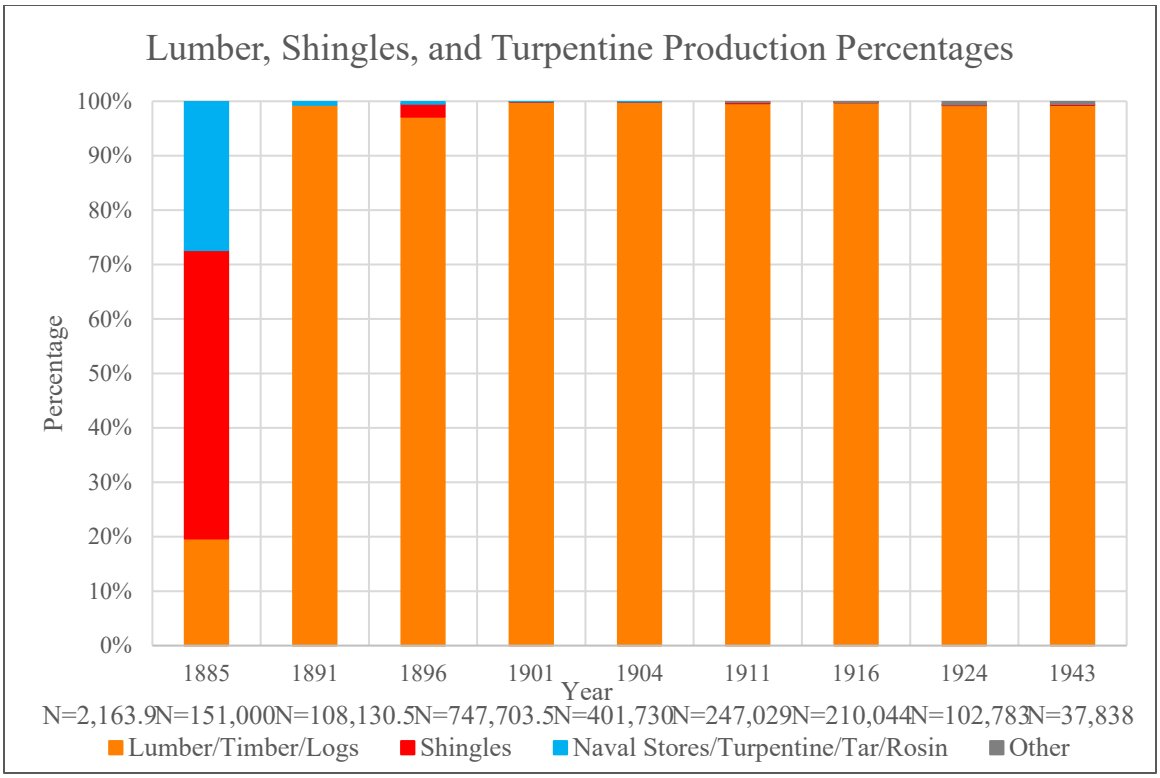


FIGURE 31: Bar graph depicting the percentage each category of goods produced for each year (Created by author 2022).

Large scale lumber production rapidly expanded from 1885 to 1901. After this period, it made up around 98 percent or more of the percentage of goods manufactured within this industry. Even though it underwent a massive decline in overall production from 1901 to 1943, by 1943 it still comprised 98-99% of the total tonnage percentage for this industry.

Shingle manufacturing followed a similar pattern as lumber. However, in 1885 it represented a large percentage of production within this industry. By 1891, this was overtaken by large scale lumber production which coincided with an overall decrease in shingle manufacturing. That sharp decline was followed in turn by an increase to all time high production in 1896. After another sharp decline, production numbers stabilized until 1916. The tonnage then dropped by 1924 and by 1943 there was only a small amount of shingle production.

Compared to both the two previously mentioned goods, the naval stores, tar, turpentine, and rosin businesses were not as prolific. It hit its high level of production in 1891 and dropped steeply in the subsequent years. By 1896 production was halved and by 1901 only 5 tons were recorded as being produced. In 1904 there was a similarly small amount manufactured, but a slight increase in 1916 was followed by a fall to zero tons in both 1924 and 1943. This was the first product that defied the trends seen in other goods analyzed so far. It had a high in 1891, a decade before other goods production peaked. It then sharply declined and did not recover over the subsequent decades and seems to have disappeared by 1924 and certainly by 1943.

The 'other' category of goods did not account for anything produced until 1911 when railroad crossties were manufactured. By 1924 the variety of goods increased and reached a production high with the manufacturing of laths, poles, and other wood products. These goods decreased once again in 1943 and included box construction components paper stock, and wooden barrels.

Figures 30 and 31 show two distinct periods for the *Lumber, Shingles, and Turpentine* industry. The first is the period from 1891 to 1901 in which all three of the traditional categories of goods reached their peak levels of production. As mentioned previously this period aligns with the timeline of Gordon Jackson's (1983) morphological theory on port development with the period of 1870 to 1914 being the height of prosperity and subsequent years representing stagnation and decline. The second time is in during the mid-1920s where the production of 'other' goods increased while everything else decreased. While the production value was many times smaller than that of lumber, it still represents a break in the overall trend of decreasing production values. To understand the larger picture of lumber production, national statistics must be considered.

Washington's *Lumber, Shingle, and Turpentine* industry both mirrored and diverged with national statistics for production. Total hardwood and softwood national production values increased from 1879 to 1913, stabilized between 1913 and 1925, decreased from 1925 to 1934, and increased from 1934 to 1945 (USDC 1949:125). Washington's lumber industry initially mirrors this with increases until 1901. The large divergence occured when production values for Washington did not see any kind of resurgence and continued decreasing through the 1920s, 1930s, and 1940s.

National turpentine and rosin production, however, did not match Washington's industrial data during any of the dates in this study. Turpentine production increased nationally until 1930 when it stabilized and decreased. Rosin production was relatively stable from 1898 to 1945 (USDC 1949:126-127). This was a complete divergence of the trend seen in Washington. By 1896, turpentine and rosin production was of minimal importance and not regarded as an important facet of Washington's economy, while it still increased in national production.

These statistics show that national trends and fluctuations in the production of these various goods did not necessarily affect the local and regional production of these industrial goods. The changes and development of the waterfront were a factor of both morphological changes and geographic considerations. General trends of regional port development argued by Jackson (1983) must be considered alongside the geographic and spatial approach of Hoyle and Hilling (1984). These various sectors of Washington's economy were integral to the survival and development of the waterfront, especially large-scale lumber production. Production values align on the timescale proposed by Jackson and with the geographic considerations of Hoyle and Hilling. The stagnation and decline period started after 1901 when production plummeted. They dropped even further because of the lack of ready pine close to the river which caused the lumber

businesses to move away or shift their transportation methods from the river to railroads. Once this process occurred, the largest businesses on the waterfront had transitioned away from the traditional method of waterborne log transportation to the more technologically superior, efficient, and connected railroad system.

A visualization of these changes can be seen in Figures 32-34, which show the southeast side of Washington's waterfront in 1885, 1901, and 1943, and represent its beginning, height of prosperity, and final decline, respectively. These are images taken from the southeastern portion of the waterfront reconstruction, where the changes in waterfront business were the most apparent. When examining the images, it should be noted that areas of "background grey" between the modeled waterfront edge and the sonar imagery are indicative of the extent to which Washington's waterfront was altered (extended and filled in) during the waterfront revitalization in the latter parts of the twentieth century.

As with the *Agriculture and Fishing* industry, these visualizations can tell us more about the archaeological record, rather than just the economic output of these businesses. As is visible in the reconstructions, the riverside businesses are receded quite a distance from the present waterfront. This gray area in the data is currently both a terrestrial site and the location of a tidal pond and drainage area that could not be accessed by boat. However, to the far right on the sonar data is a rectangular structure adjacent to the current waterfront. To the right of that structure is a set of pilings extending perpendicular from the shoreline. Both these structures could be investigated further and may be related to the lumber businesses in the area during the 20th century. There is also an opportunity to investigate the area in which this survey was not able to access, which is the previously mentioned gray area in between the data and the reconstructions.

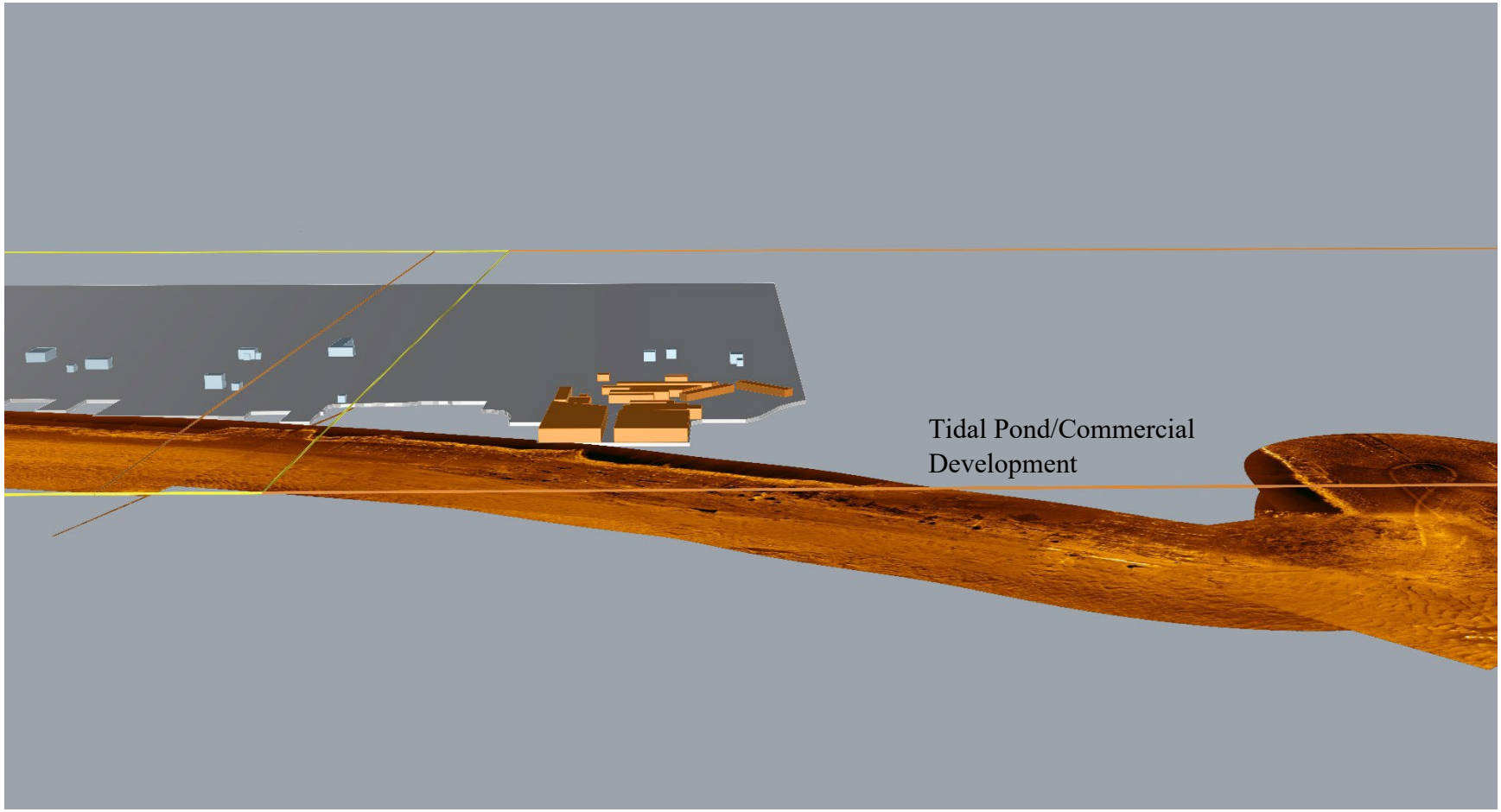


FIGURE 32: Close up view of the sonar data overlayed on the 1885 reconstruction showing the *Transportation* (light blue) and *Lumber, Shingles, and Turpentine* (orange) layers (Courtesy of the author).

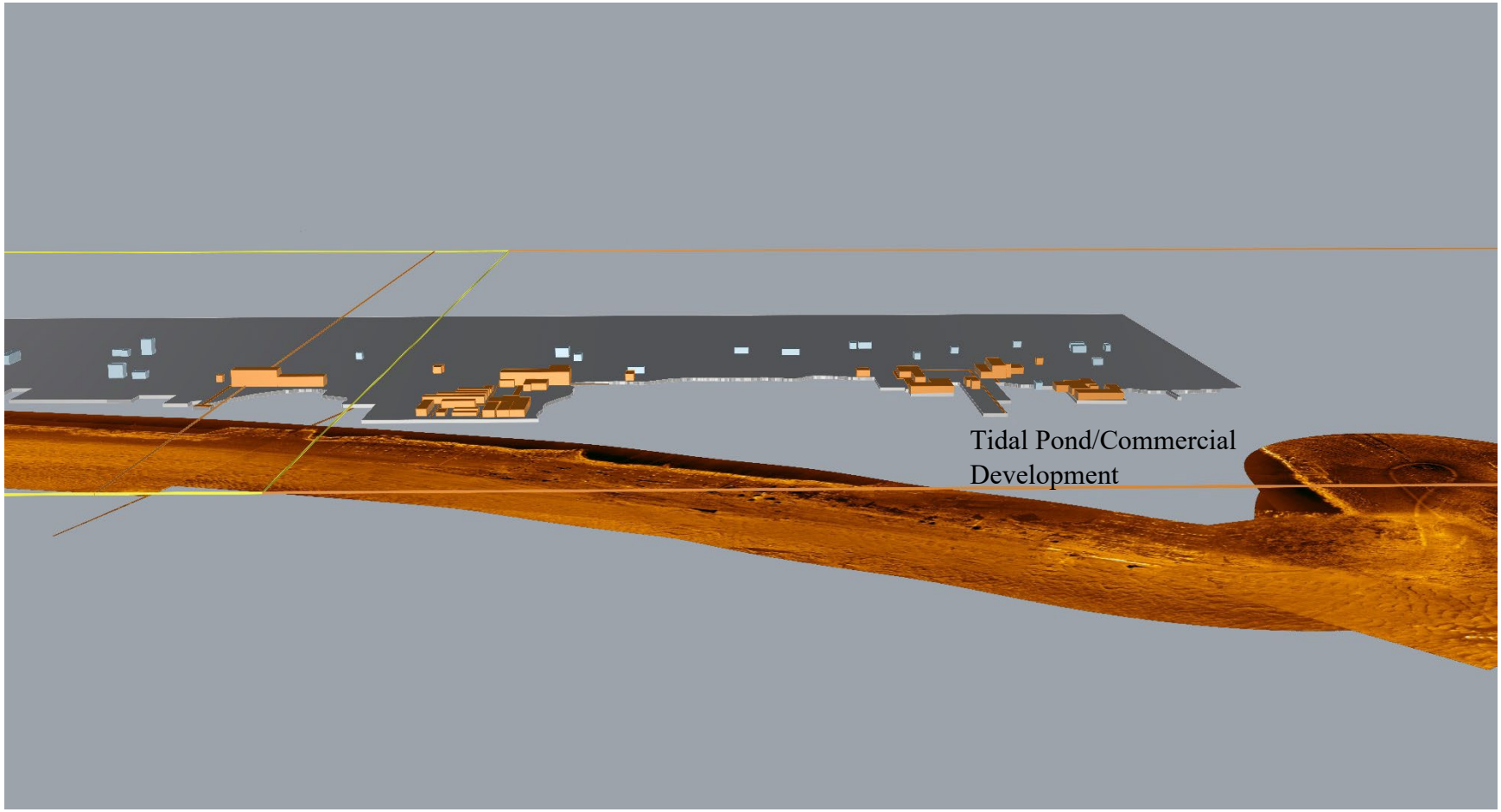


FIGURE 33: Close up view of the sonar data overlayed on the 1901 reconstruction showing the *Transportation* (light blue) and *Lumber, Shingles, and Turpentine* (orange) layers (Courtesy of the author).

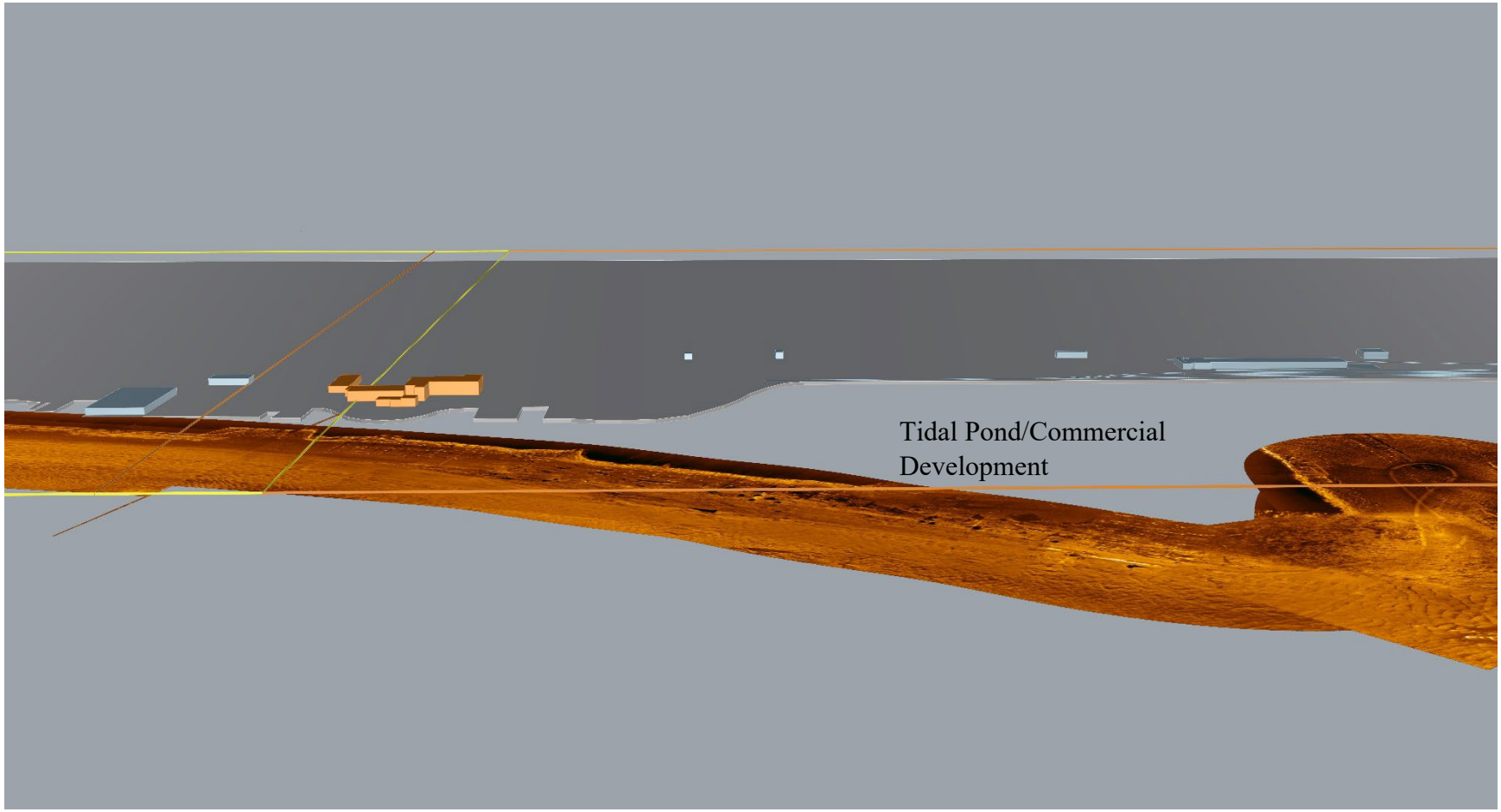


FIGURE 34: Close up view of the sonar data overlayed on the 1943 reconstruction showing the *Transportation* (light blue) and *Lumber, Shingles, and Turpentine* (orange) layers (Courtesy of the author).

The industrial expansion from 1885 to 1901 is striking, as is the decline from 1901 to 1943. The *Transportation* sector is visible with the *Lumber, Shingles, and Turpentine* industry. *Transportation* grew from stables in 1885 and 1901 to railroads and gas stations by 1943. One interesting thing to consider is that the railroad was initially built around the southeastern most lumber mill but remained even after that lumber mill had disappeared. This may suggest that the railroad was initially dependent on the business of the lumber mill, but that dependence decreased to the point that when the lumber mill ceased operations, the railroad was able to stay due to other factors or business. Changes in technology and the availability of raw materials in the immediate geographic area seem to be the most likely reasons for the decline of the *Lumber, Shingles, and Turpentine* industry.

Machine Shops and Foundries

The production of the *Machine Shops and Foundry* industry on Washington's waterfront is discussed in this section. Figure 35 below shows the breakdown of goods produced by this sector of the economy and how many tons of each goods were produced in each year. Machinery is denoted by a dark green line, Iron Goods is a green line, and Hardware is denoted by a light green line. The 'Other' category is a gray line. The production values of this industry were quite variable, especially in the first few years of the study. This is also the first industry that totally diverged from the expected pattern of high production through 1901 followed by a sharp decline until 1943. This industry is denoted by the spike in production in 1911 of iron goods. Other goods has an increase in production by 1943, however, which is a pattern that diverges from the other waterfront industries.

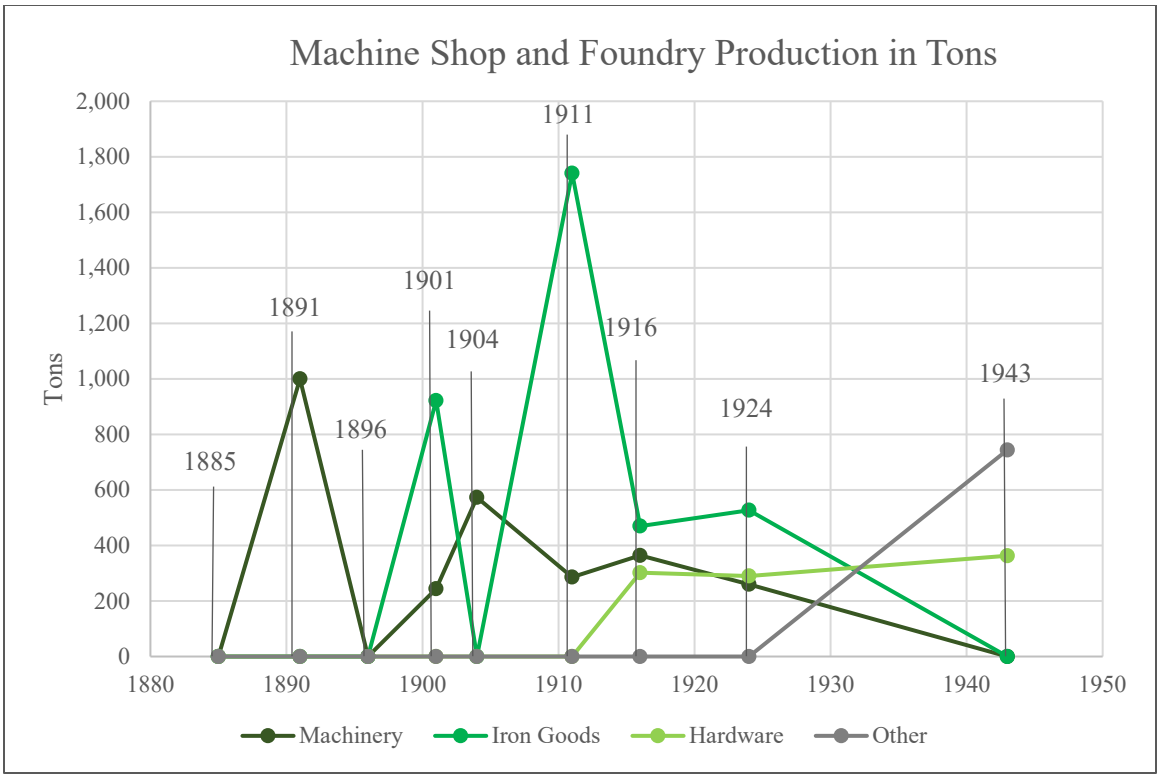


FIGURE 35: Line graph for *Machine Shop and Foundry* production statistics for Washington (Created by author 2022).

There was no production in 1885, followed by a spike in production of machinery in 1891. There was once again no production of any of these types of goods in 1896, but 1901 saw a rise in production of machinery and iron goods. In 1904, however, only machinery was manufactured. Manufacturing for this sector of the economy peaked in 1911, contrary to the other previously analyzed industries. Iron goods underwent a corresponding decrease in 1916 while hardware and machinery had slight increases. This trend continued in 1924, except for machinery which decreased in 1924. By 1943, however, iron goods and machinery had no production while the market was overtaken by 'other' goods and hardware production. 'Other' goods were mainly composed of steel manufactures. Figure 36 shows the percentage of total production that each category for this industry produced for each year of the study.

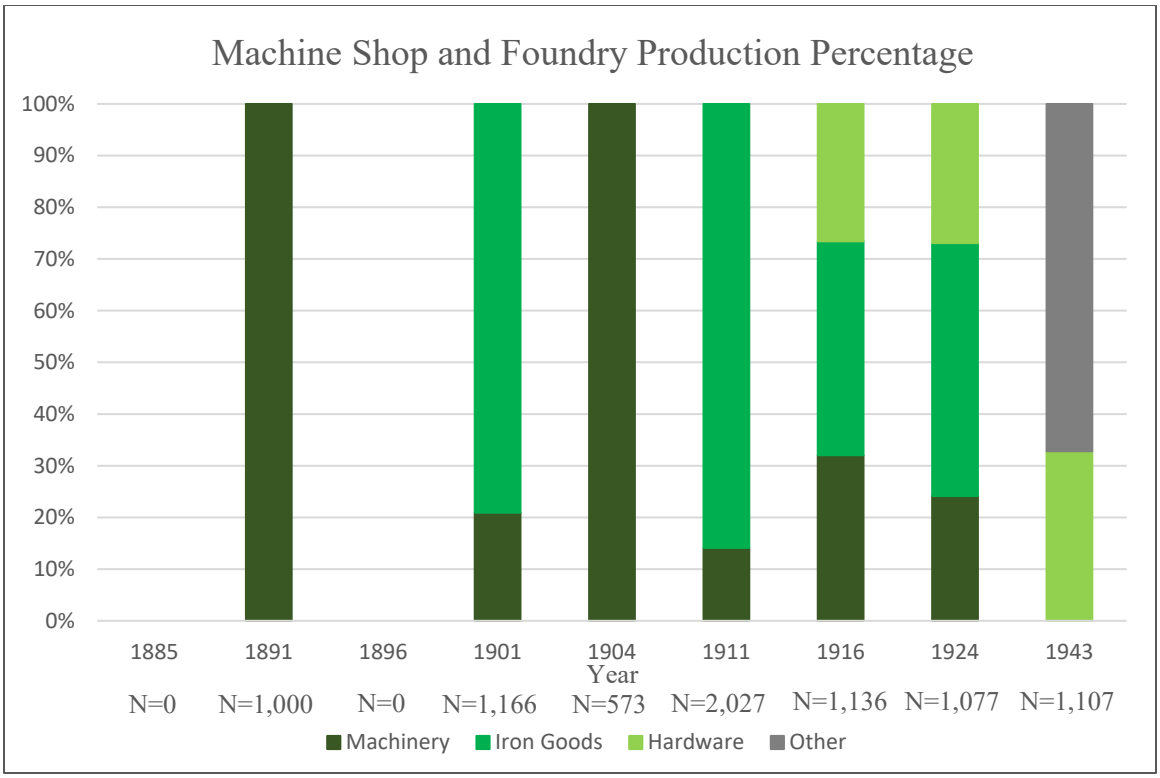


FIGURE 36: Bar graph depicting the percentage each category of goods produced for each year (Created by author 2022).

It is difficult to determine what effect this industry had on the waterfront. The production values are small compared to the other industries and they are so variable between 1885 and 1911 there is barely any pattern to discern. This industry was also composed of a one or two building complex on the waterfront, but it did not have a large footprint on the waterfront. Even so, a pattern begins to emerge by the last three years of the study.

Bergholm et al. (2007) argued for a holistic and comprehensive approach to port development and that theoretical assessment starts to appear through the analysis of the *Machine Shops and Foundry* industry of Washington. A clear shift becomes apparent in the last three years of the study. The dominance of iron goods and machinery fades and is supplanted by mainly steel goods of the 'other' category. This is supported by a national increase in the production of iron and steel goods between 1899 and 1945, with steel replacing iron in

Washington by 1943 (USDC 1949:180). While this is only a small sector of Washington's economy, it shows that historic changes such as the switch from iron to steel in manufacturing processes is a viable option to combat negative changes in port development. This strategy was employed by this industry on the waterfront; however, this was only a small portion of Washington's waterfront production while morphological changes and geographic deficiencies continued to work against maritime commerce as the century advanced.

Merchandise and Miscellaneous

This section analyzes the *Merchandise and Miscellaneous Goods* industry production. Figure 37 below shows the production in tons; merchandise is gold; fertilizer is green; raw materials is blue; oil products is black; construction materials is brown; and other is gray.

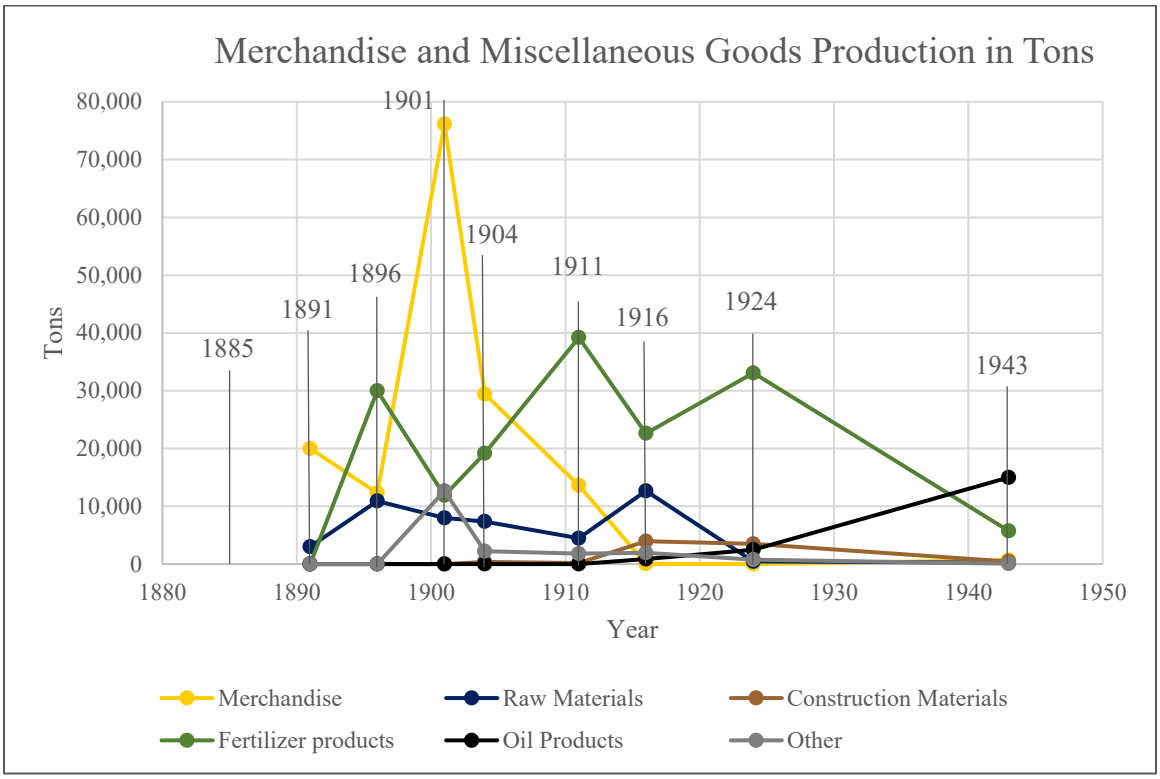


FIGURE 37: Line graph for *Merchandise and Miscellaneous Goods* production statistics for Washington (Created by author 2022).

Merchandise and other products spike in 1901 and decrease afterwards, comparable to the other industries analyzed previously in this chapter. However, fertilizer products reach their peak in 1911 while raw materials peaked in 1916. Construction materials remain low during all years included in this study; however, oil products make up a large amount of tonnage and market share of the industry by 1943.

Figure 38 below shows the production of merchandise and miscellaneous goods as a factor of the total percentage of production output. Even though there is merchandise data for 1885, it is not included in these graphs because the units of measurements could not be determined. Total tonnage values for the *Merchandise and Miscellaneous* goods industry are quite high as well, comparable to the *Agriculture and Fishing* industry.

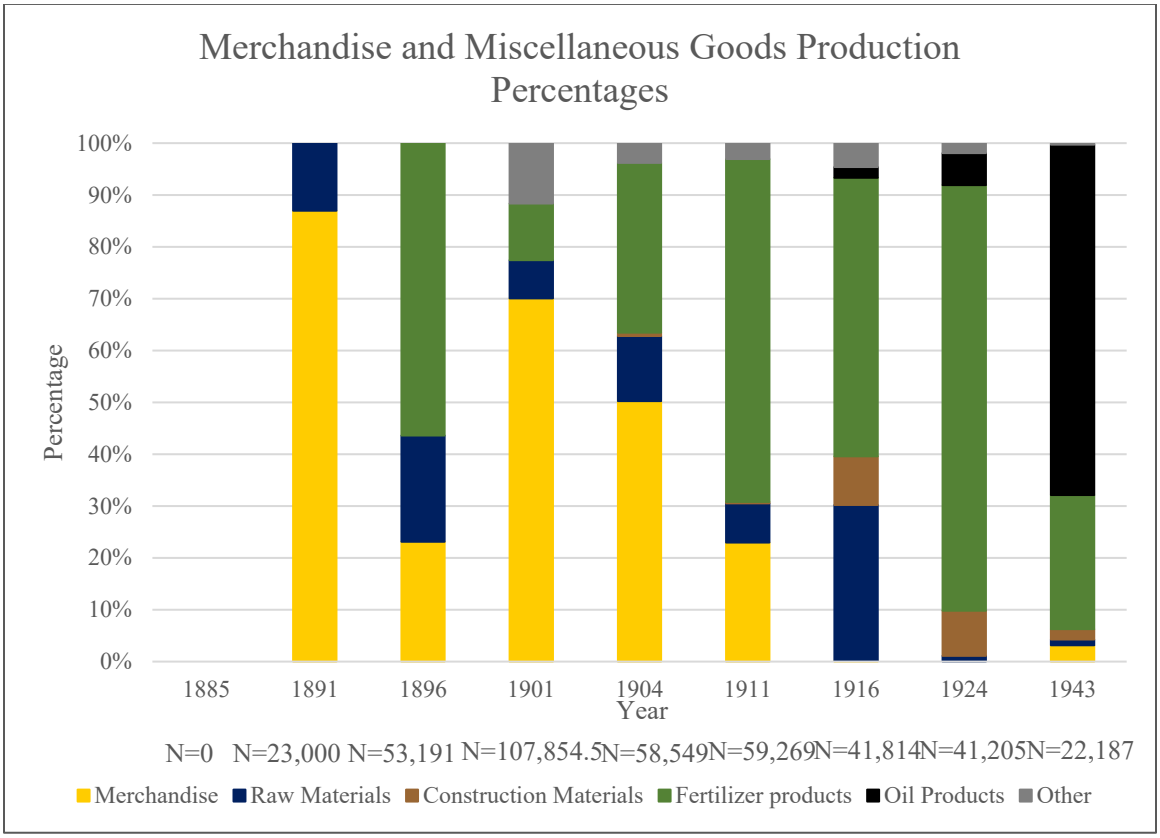


FIGURE 38: Bar graph depicting the percentage each category of goods produced for each year (Created by author 2022).

The locations producing these goods are scattered in a decentralized way among the town of Washington; they were dispersed throughout the town and had no set layer in the reconstruction. They are not necessarily dependent on the waterfront; however, it is the only industry that seems to be at least partially successful in reviving production values by 1943. Some values such as the construction materials or the other category cannot give much insight into this industry's connection to the waterfront of larger trade networks.

Patterns of evolving good production are apparent when comparing the types of goods within this industry. Two distinct phases of *Merchandise and Miscellaneous goods* production become apparent. The first is the period from 1891 to 1911 when the largest categories of goods for this industry are fertilizers and merchandise. This shifts during the second period from 1916 to 1943 when fertilizer then oil supersedes the production of all other goods.

When comparing these two periods of deviation to national statistics, a few trends appear. Washington's merchandise production decreases after 1901, however, national merchandise production increases quite rapidly until the early 1930s when the demand for those products decreased (USDC 1949:180-182). Fertilizer followed a similar pattern, although on a different timeline. National production of those goods increased constantly from 1880 through 1945, while Washington's production of them decreased sharply from 1924 to 1943 (USDC 1949:148). Washington's oil production is the only category of goods that matches well with the national average, which increased steadily from 1893 to 1945 (USDC 1949:146).

These trends align with Bergholm et al.'s (2007) holistic approach to port development. Historic events and economic shifts certainly played a large role in the evolution of Washington's *Merchandise and Miscellaneous Goods* industrial production. While Washington's merchandise production decreased after the turn of the century, the national

decrease in merchandise production after 1930 was undoubtedly caused by the Great Depression which decreased demand for such household products. While there are no data points for merchandise production in Washington for the 1930s, a slight resurgence in 1943 could point to a renewed demand for such goods. The almost continuous production of fertilizer could possibly be attributed to the larger national trends of agricultural production increases described in the *Agriculture and Fishing* industry section; however possible, there is scarce data to positively correlate the two. One positive shift seen is the increase in oil product production which embodies global economic shifts described by Bergholm et al. (2007). There was an increasing demand for oil products, especially by 1943 when that good was the main source of energy for most machinery, cars, and larger ships. Washington increased its production and diversified into this new market to fill increasing demand.

Washington's *Merchandise and Miscellaneous Goods* was the largest industry investigated that was able to diversify and adapt to new regional or global demands. However, it was not directly connected to the waterfront and could not help to increase waterfront production or slow the decline of commerce that utilized the waterfront for transportation.

Total Commercial Analyses

This section includes a total commerce and square footage analysis, as well as a total commerce and federal expenditure on river improvement analysis. The total commerce and square footage comparison provides an understanding into correlations and possible divergences between industrial output and the square footage of each industry. Total commerce and river improvement analyses the possible correlation between commerce on Washington's waterfront and annual federal expenditures on river improvement. Correlations or divergences between data

points in these two analyses will help to expand on conclusions that have already been made previously in this chapter.

Total Commerce and Square Footage Analysis

This section analyzes the comparison of tonnage production to area occupied by each industry. The total tonnage graph is given below in Figure 39. Commerce for each industry is given as well as the total commerce for Washington in that year: the *Agriculture and Fishing* industry is red; *Machine shops and Foundry* industry is green; *Lumber, Shingles, and Turpentine* industry is orange; *Merchandise and Miscellaneous Goods* is golden; and the *Total* commercial production is black.

Figure 40 is a graph of the total area in square feet for each category of building on the waterfront that appear in the three-dimensional reconstructions. The *Agriculture and Fishing* industry is red, *Lumber, Shingles, and Turpentine* is orange, *Machine Shops and Foundry* is green, *Shipyards* is blue, *warehouses* are yellow, *Transportation* is turquoise, and *Town Buildings* is grey. Each graph is a line graph with the decades between 1880 and 1950 delineating time. Each year of the study from 1885 to 1943 is marked and labelled on the graphs.

These graphs highlight an interesting dynamic. While there is correlation between growing production values and square footage increases, they are not simultaneous occurrences. This is apparent with the two largest industries on the waterfront, *Lumber, Shingles, and Turpentine*, and *Agriculture and Fishing*. There is a lag time between the spike of values in 1901 and the corresponding square footage increases which occur in 1904 and 1911, respectively.

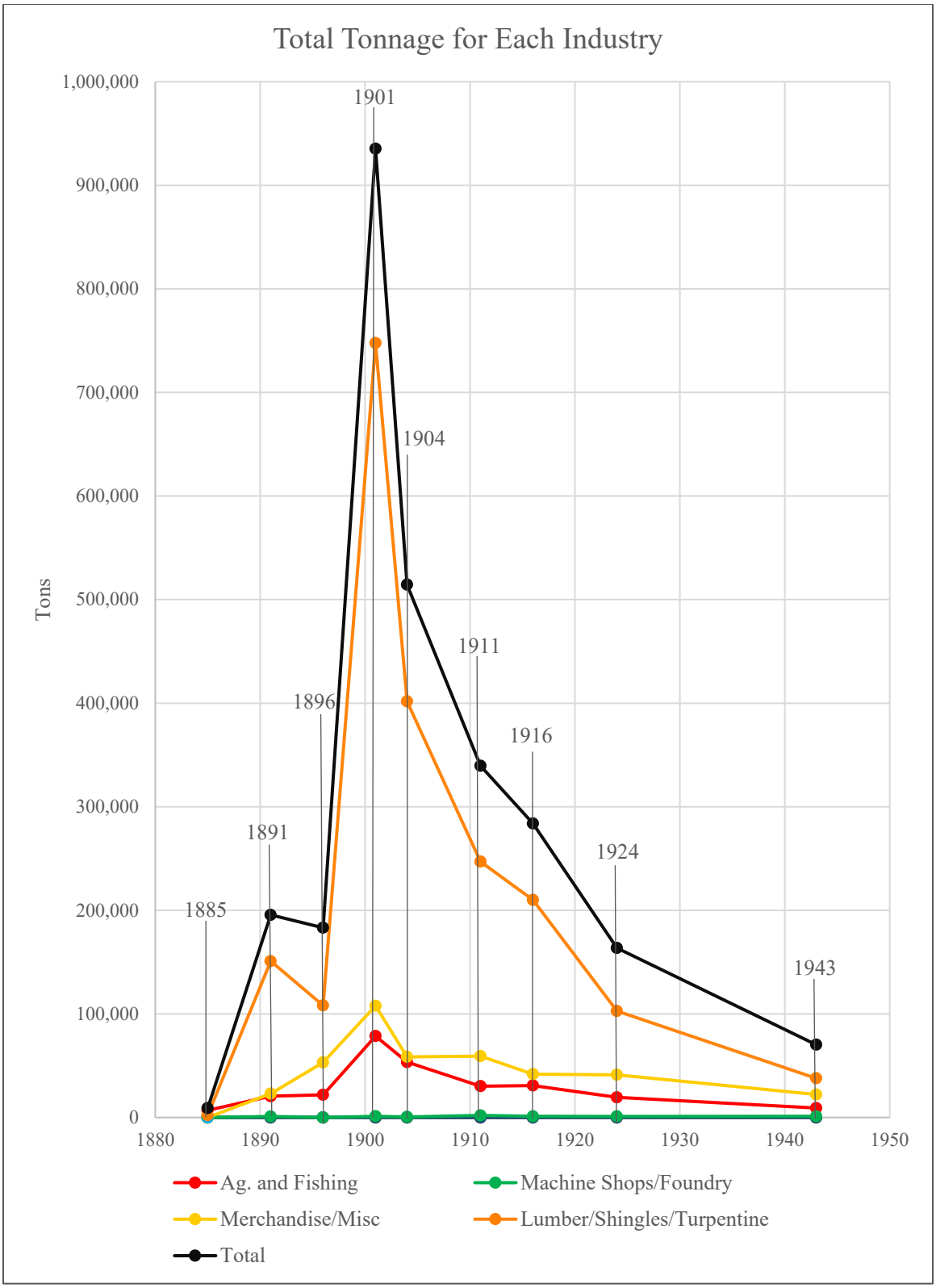


FIGURE 39: Line graph depicting the tonnage production for each industry and the total production of goods for Washington (Created by author, 2022).

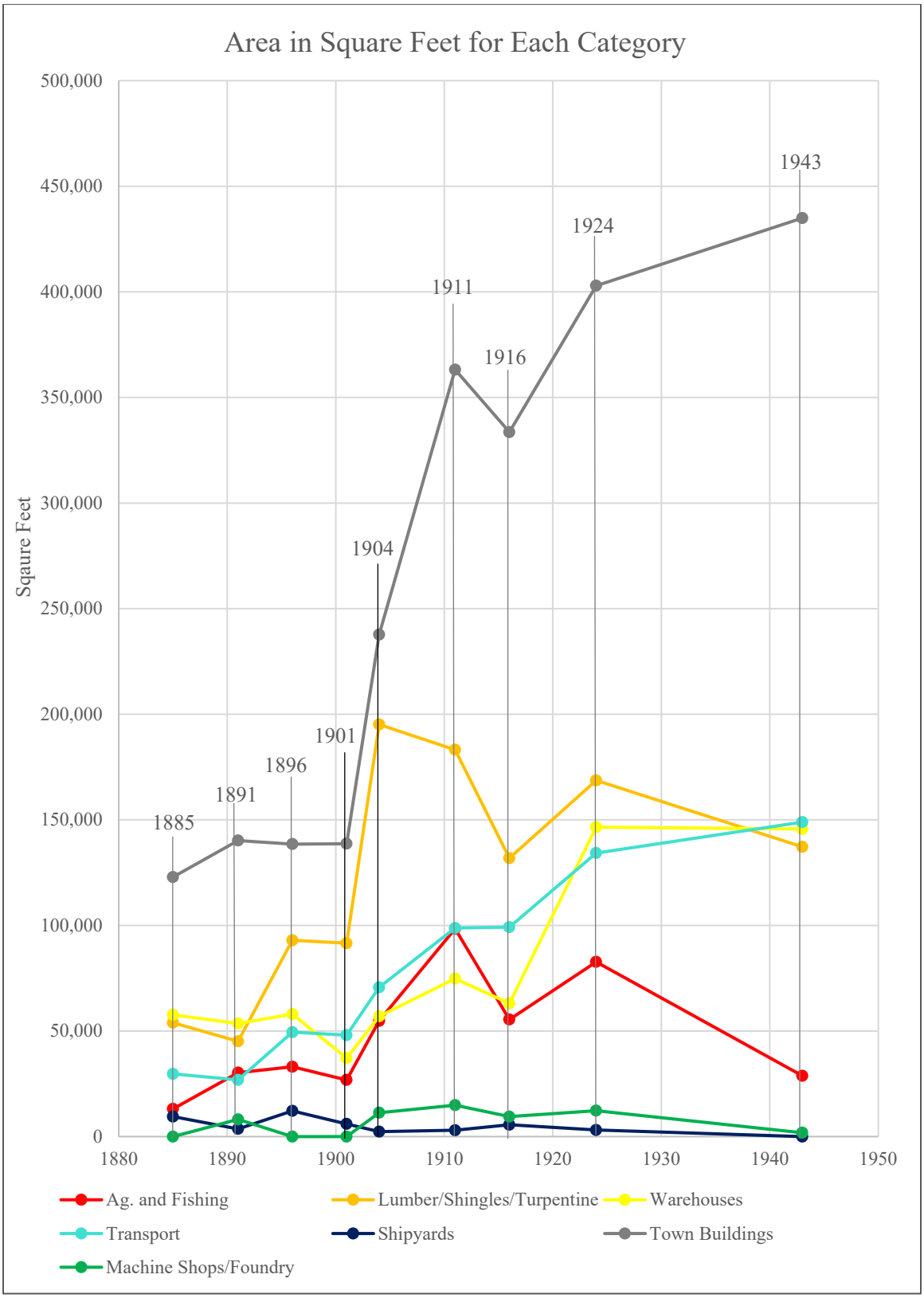


FIGURE 40: Area in square feet over time for each industry (Created by author, 2022).

The increases in area in 1904 for *Lumber, Shingles, and Turpentine* correspond to production increases in 1901, but not to the values that appear for 1904. This is comparable to *Agriculture and Fishing* which has production highs in 1901 and 1904, but a square footage increase does not appear until 1911. This square footage increase of these industries may have been a response to keep up with the high levels of production of the previous years, however, production declines shortly after the square footage increases. This shows these foundational waterfront industries responded to increasing production numbers by extending their square footage and presumable production capacity, however, production values decrease sharply afterwards, which was detrimental to their businesses and the expenses related to square footage expansion.

Transportation steadily increased throughout the entire period, which began with stables and boathouses but soon expanded at the turn of the century with a marked increase due to the introduction of a multitude of railroad lines. *Warehouses* along the waterfront underwent a noticeable, steady increase throughout the entire period as well. The combination of the waterfront transportation and the incoming and outgoing railroad business most likely caused this increase. This is a noticeable deviation from the decline of waterfront commerce. Even when production of waterfront goods decreased across most industries, the warehouses used to store goods increased.

Town Building square footage increased after 1901 and continued to rise steadily through the rest of the period. These buildings were mostly dwellings; however, they were also general businesses, markets, grocers, offices, hotels, and many more types of businesses that were not directly linked to waterfront industrial production. This exemplifies further deviation from the importance of the waterfront. The population grew during this time, but so did the number of

businesses that were not necessarily reliant on the waterfront for trade and transportation. The *Merchandise and Miscellaneous Goods* industry made up some of these structures and was the only industry to adequately develop after the waterfront industries declined. *Machine Shops and Foundries* and *Shipyards* remained on the waterfront; however, their production values were negligible, and any kind of growth or decline is difficult to discern with such a small square footage and waterfront production.

Total Commerce and River Improvement Analysis

This section analyses the possible links between federally expended funds on river improvement and maintenance and total commerce. Total commerce is analyzed using the tonnage values for each year, since monetary values for total commerce occur in only a few of the years. This comparison is given in Figure 41. Federally expended funds are in a standardized 2022 dollar value on the left vertical axis. Commerce in tons is labelled on the right vertical axis.

This graph depicts the relationship between the funds expended on improvement and maintenance of the Pamlico River at Washington and the total commerce of Washington's waterfront. For the first few years of the study, while commerce steadily increased, the government allocated a relatively stable amount to the improvement of the river. However, the commerce spike at the turn of the century was followed by a spending hike by the government. This spending increase was due to the increasing cost of work conducted on the ongoing improvement and maintenance of the river. By 1904, three dredges were continuously working on widening, deepening, and clearing the channel above and below Washington. All three had not been present in the previous years and cost more than the previous intermittent work

(UASCE 1904:1479). This is an increase in intensity in the project, however, it is unclear if it is a reaction to the increase in commerce.

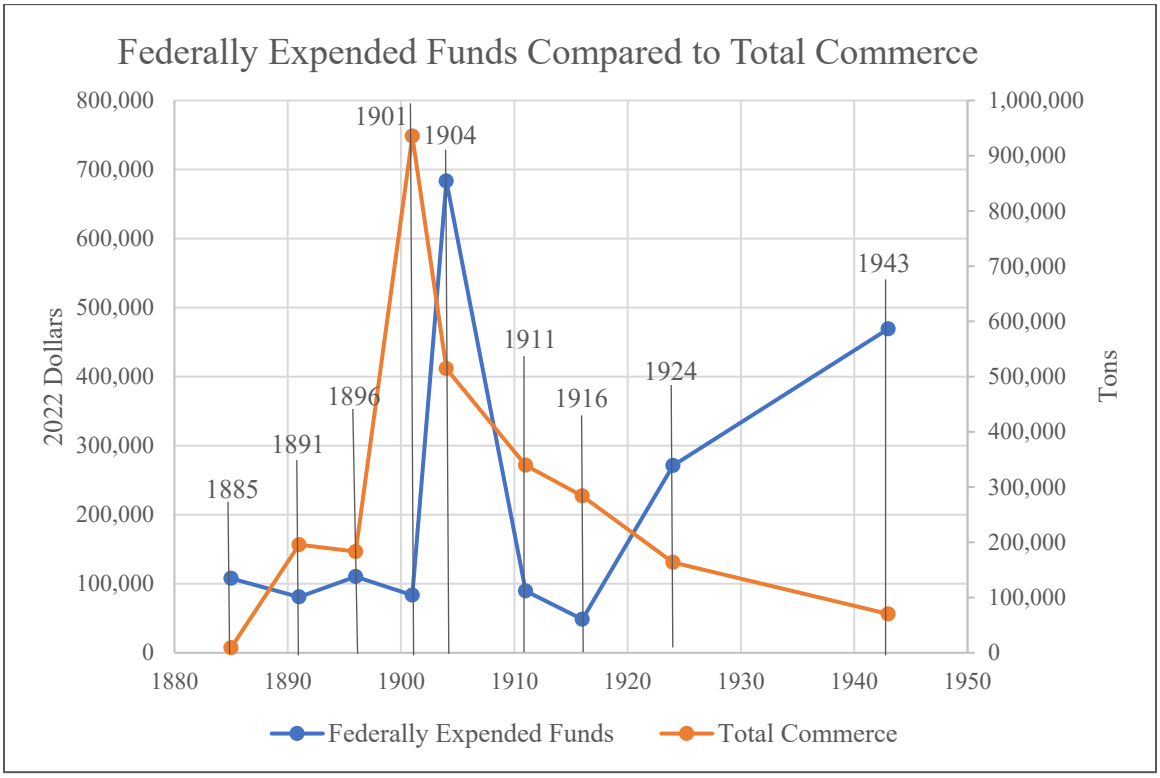


FIGURE 41: Federally expended funds compared to Washington's yearly total commerce (Created by author, 2022).

A period of decline in the overall commerce and federally allocated funds followed. The decrease in commerce has been analyzed in detail, however, the decrease in funds through 1916 is because the river improvement project on the Pamlico River was completed in 1915 (USACE 1916:542). A second divergence occurred between 1916 and 1924 where commerce levels continue their decrease, however, federally allocated funds increased. This increase appears to be due primarily on the expansion on the Pamlico-Tar River project and a resumption of maintenance work around Washington. While the project that ended in 1915 was primarily concerned with the clearing of the area around Washington, the new project from 1916 onwards primarily dealt with maintenance around Washington but also the expansion and improvement of

the Tar River up through Greenville and Tarboro (USACE 1919:631). That increase of funds was primarily concerned with the upriver improvement rather than further improvement on the Washington waterfront or any kind of attempt to slow the decline of Washington's maritime commerce. However, statistics on national expenditures on harbor and river improvements during that time is lacking so any correlation to larger trends cannot be made.

While initially the two figures appeared to relate to one another, upon further examination, the federal funds were increases in spending to finish an already existing improvement and maintenance project through 1915. The increase in funds after 1924 was primarily due to increasing the expenditure for improvements on the Tar River, upriver from the port of Washington.

Waterfront Development Conclusions

Throughout Washington's early modern history, the waterfront was composed of traditional industries with main products. In the *Agriculture and Fishing* industry cotton products, grains, starches, vegetables, and the aquatic harvest made up traditional production. In turn, it occupied a large portion of the central waterfront in town. In the *Lumber, Shingles, and Turpentine* industry large scale lumber manufacturing was by far the highest producer. It also occupied a large portion of the waterfront on both the northwestern and southeastern edges of town. *Machine Shops and Foundries*, while a smaller portion of production and waterfront occupation, still produced important machinery and hardware. *Merchandise and Miscellaneous Goods* was dominated for most its history by production of general merchandise and fertilizer products.

As time went on, however, the traditional industries and their goods were usurped by secondary goods. However, this does not necessarily mean that the waterfront disappeared with these goods. The introduction of other types of goods in some industries shows a resilience in Washington's waterfront system. There appears to have been a shift into more modern goods by 1943. By this point steel, oil, and continued fertilizer production indicated an evolution in production rather than a complete demise.

It seems that historically, the rise to prominence, height of prosperity, and decline timeline proposed earlier in this thesis is better used to describe Washington's traditional industries rather than the waterfront and town. While production of goods dropped off dramatically, the ties between those industries and the prosperity and growth of Washington may not have been as strong as it may initially seem. In fact, even when production of those historical goods declined, the number of houses, markets, hotels, parking lots, gas stations, grocers, merchandise businesses all steadily increased.

Even though the links between the town and the traditional businesses may be loose, the link between the waterfront and its supporting industries appears to be strong. The indication of this is the federal funds spent on the improvement compared to overall tonnage production. When production dropped and the river maintenance increased, there was no effect on the decline of overall production. This indicates that even though the businesses were diversifying into other goods, those goods may not have been as connected to the waterfront and riverine commerce as the more traditional industries, such as lumber, cotton, and fisheries products.

All these factors and connections are evidence of the theoretical principles laid out in the beginning of this thesis. Gordon Jackson argued for the morphological changes of ports, in that they react and adapt to the needs of the world (Jackson 1983). This is apparent with

Washington's shift in good production. Hoyle and Hilling argued for the historical-geographic approach, where successful ports are connected both to the hinterland and the wider seaward markets (Hoyle and Hilling 1984). The hinterland connectivity to Washington was based on upriver travel and the introduction of railways. The seaward connectivity was based on the downriver channel that connected the waterfront to the rest of the Pamlico Sound and beyond. This was one of Washington's weaknesses, because its geographic position necessitated the continual dredging and clearing of the channel. Bergholm et al. (2007) argued for a holistic approach to port development that uses a combination of morphological, historical, geographic, and economic theories to explain the development of ports. A port's ability to adapt to change, its economic potential, and its connectivity to the outside markets all contributed to its success or failure. This is exemplified in Washington by its largest industry, lumber. By 1918, the decrease in waterfront lumber production resulted from most of the lumber close to the river having already been logged. There was no reason to ship inland lumber downstream when railways were a more economic option (USACE 1918).

All these historical trends, economic data, and theoretical approaches point to the fact that Washington's waterfront industries declined due to shifts in supply and demand. The traditional industries and their associated waterfront transport became unviable businesses. As these traditional businesses shuttered, the town continued to grow, and other businesses took their place. However, these new businesses were not as connected to the waterfront as the previous manufacturers, and the waterfront steadily fell out of commercial use. Due to these changes, the town council decided to permanently end the commercial waterfront and change it to a strictly recreation based use, with the work being completed in 1973.

CHAPTER 7: CONCLUSION

To complete this work, it is necessary to revisit the research questions proposed at the beginning of the thesis to ascertain if this study adequately answered the proposed questions. The primary question that guided the research is "*can a visual reconstruction of the progression of Washington's waterfront provide an adequate assessment as to why and how the industry of the waterfront declined and eventually disappeared?"* This research was a study of Washington and each secondary question proposed related to different aspects of the town's waterfront. Some of these questions can be accurately assessed, while others ended up being too large and out of the scope of this research to reach any kind of substantiated conclusion. The secondary questions will be answered one at a time, once that is completed then the answer to the primary question will be explained. The questions were as follows:

Primary Question:

- Can a visual reconstruction of the progression of Washington's waterfront provide an adequate assessment as to why and how the industry of the waterfront declined and eventually disappeared?

Secondary questions:

- What contributing economic factors led to the decline of the waterfront industries?
- Was the decrease of trade the primary factor for the dissipation and eventual abandonment of the industrial waterfront?
- Does this methodology provide a viable option for further research, both inside and outside of academia?

- What contributing economic factors led to the decline of the waterfront industries?

The answer to this question is both straightforward and yet unclear. There are two types of factors that are apparent when looking at economic problems. One factor is the internal economy of the location in question, the second factor is the external economy of the nation or globe that is connected to the research location. Nationally, there were trends that became apparent through the analysis. Most of the increasing trends of production seen throughout the United States during the period of study were not mirrored by Washington's waterfront production rates. This means that internal factors must be located to determine the port's decline.

Internally, there are economic factors that point to the decline of the traditional industries. The *Lumber, Shingles, and Turpentine* industry was, throughout the years studied, the staple industry of Washington. By the mid-1940s, however, it had been reduced to less than 10 percent of its peak production. As has been already discussed, by 1918 the waterfront lumber was mostly logged, and the inland lumber shipped by rail. The exhaustion of waterfront resources is one big contributing factor. Another would be a shift away from Washington's traditional goods. Cotton products shipped on the waterfront steadily decreased over time until 1943 when it was not even recorded. Other traditional goods such as hay and tobacco stopped being produced as well. This all occurred while the town seems to have diversified into oil, steel sugar, molasses, and Coca Cola products. While this diversification helped the town, the waterfront and its industries were not supported by these products, and these products did not rely on the waterfront. The shift away from the production of traditional goods was a major contributing factor to the decline of the waterfront and its industries.

- Was the decrease of trade the primary factor for the dissipation and eventual abandonment of the industrial waterfront?

The decrease of trade seems to be the one primary factor that appears across each industry studied in this research. Most goods traded on the waterfront for one reason, or another eventually decreased by a massive amount or stopped all together, particularly from 1904 to 1943. One important thing to note is that by 1943 many more recreational motorboats were registered as coming into and out of Washington compared to larger trading vessels which were few and far between (USACE 1944:497). The vastly decreased trade and the increase in recreational vehicles most likely played a large part in the decision to abandon the industrial waterfront in favor of one with recreation as its focus.

- Does this methodology provide a viable option for further research, both inside and outside of academia?

To effectively answer this question, an entire other study needs to be conducted on the social impacts and interest rating of these kinds of presentations on the internet, in museums, and other places of dissemination of historic knowledge to the public. However, with the right method of presentation, this type of study is a viable way at visualizing and analyzing the past. Chronological map overlays can give a fantastic representation of the development and decline of different port industries. Overlaying reconstructions with underwater or terrestrial archaeological remote sensing data may be a viable way to determine the possible locations of archaeological sites, as well as minimize impacts to them. There are also a number of ways that a study like this can be modified to work with specific areas, towns, or cities. In the right format, preferably digital, and with the right type of historical data this can be a powerful tool to analyze historical trends.

Final Verdict

While this research did not touch on all the data regarding Washington and its historic port, the process of creating these models and sorting through the data showed an impressive resilience of the economy of Washington. The author does contend that *a visual reconstruction of the progression of Washington's waterfront provides an adequate assessment as to why and how the industry of the waterfront declined and eventually disappeared*. Visualizations combined with archaeological, historic, and economic data provided a new, valuable way to look at and potentially reinterpret history. This entire process laid the groundwork for hopefully future research while also opening new avenues of exploration.

This part of Washington's economic past has been overlooked for quite some time and shedding a light on this era of its history shows a town that is ready and willing to adapt to changes. The large industries declining, and the waterfront commerce's demise is only half the story. While that did occur, the economy diversified into goods that were suited for the modern world, such as oil and steel. The commerce also technically disappeared but it was replaced by personal watercraft and motorboats that were carrying on personal recreation rather than seaborne trade. Seeing these changes, the town decided to evolve from the old, worn-down jetties and piers of the once thriving industrial waterfront, to a now thriving recreational waterfront.

While this study produced interesting results related to the growth and decline of Washington's waterfront, there are some issues with the data at hand. Most notably, the years between 1924 and 1943 are blank. This is a glaring hole in the research which is not present in the previous years. While the graphs show a steady decline in this time, it is not clear what it looked like in those intervening years. Possible yearly increases or decreases are missing and

may have led to incorrect assumptions that the decline in that time was constant. Another problem is the diversification of industry is not accounted for in the 3D reconstructions. Most of those industries are lumped in with 'town buildings' by 1943 which prevents a true visual representation of the end stages of Washington's industry.

Future Research

There are plenty of opportunities to research the port of Washington further. There are a further 550 pages of United States Army Corps of Engineer reports that have not been fully analyzed. Further reconstructions may be possible if more maps, such as the Sanborn used in this thesis, are found. More archaeological surveys can be conducted in the Pamlico River as well as using ground penetrating radar to try and locate any existing structures on the current waterfront. GIS can be used to track the upriver and downriver commerce of Washington which is listed in the USACE reports after 1910. Photogrammetry can be used to recreate the waterfront in a more realistic sense. There are really an endless number of possibilities for future research on this topic.

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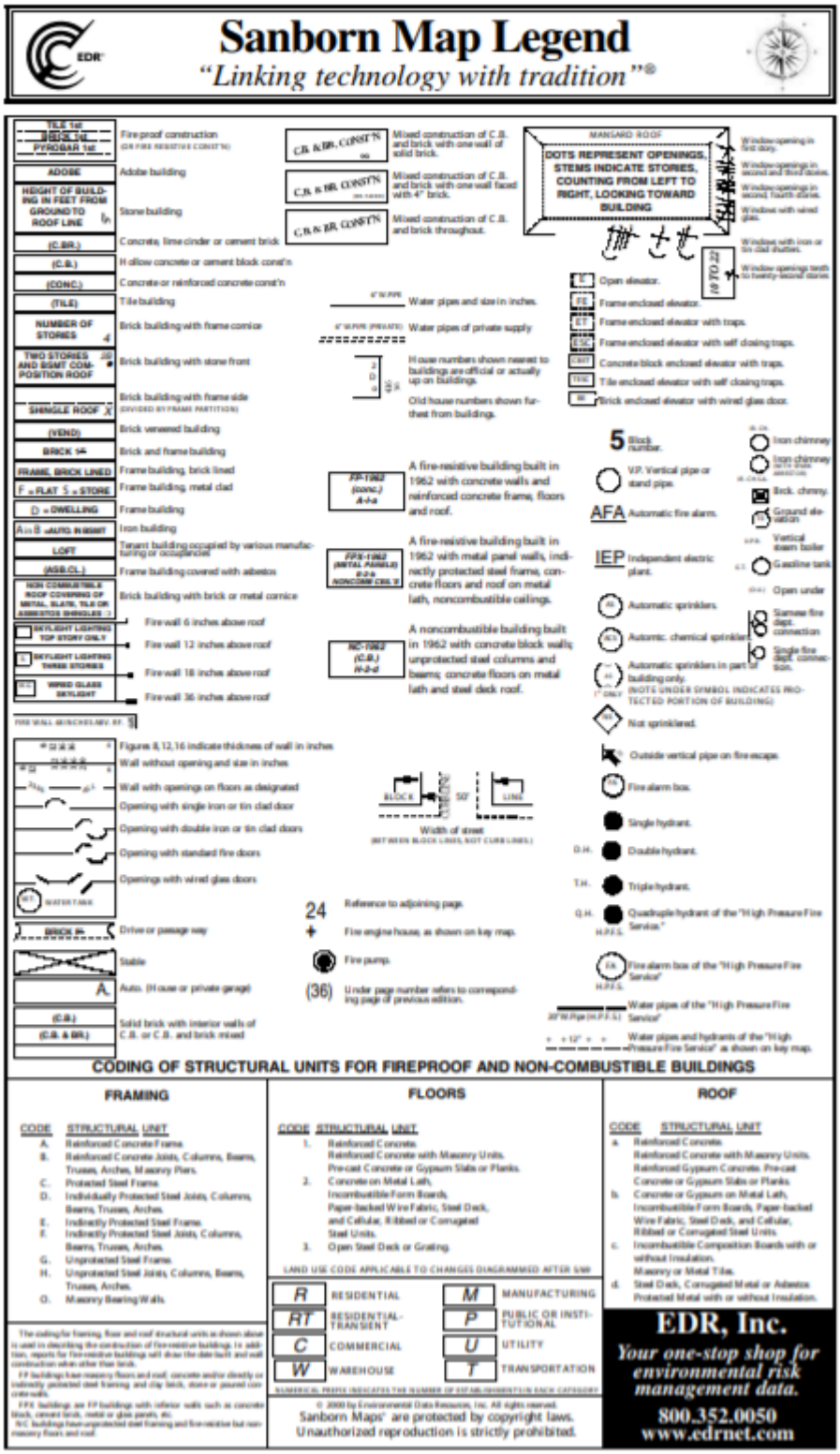
APPENDIX A

Sanborn Map Abbreviations

"Linking technology with tradition"®

Abbreviation	Meaning
A	Automobile (usually designates the location of a garage)
A in B	Automobile located in basement
A S	Automatic sprinkler
Abv	Above
ACS	Automatic chemical sprinkler
AFA	Automatic fire alarm
Agr	Agricultural
Appts	Apparatus
Apts	Apartments
Asb Cl	Asbestos clad
Att'd	Attended
Audit'm	Auditorium
Auto Ho	Automobile house, or garage
B	Basement, boiler or occasionally brick
B&S	Boots and shoes
BPOE	Benevolent & Protective Order of Elks
B Sm	Blacksmith
B'ldg	Building
B'lr.	Boiler
B'lt	Basement
Bak'y	Bakery
Balc	Balcony
Bap	Baptist
Bbl	Barrel
Bbls	Barrels
BE	Brick enclosed elevator
Bill'ds	Billiards
Bl Sm	Blacksmith
Blk Sm	Blacksmith
Bst	Basement
C B	Cement brick or concrete block construction
C Br	Concrete brick or cement block construction
Cap'cy	Capacity
Carptr	Carpenter
CBET	Concrete enclosed elevator with traps
Chem	Chemical
Chinaw	Chinaware or porcelain
Chine	Chinese
Cl	Clad
Clo	Clothing
Co	Company
Comp	Composition construction (i.e. stucco) or compressor
Conc	Concrete
Conf'y	Confectionary (candy store)
Confec'y	Confectionary (candy store)
Constr'n	Construction
Corp'n	Corporation
D	Dwelling
DH	Double (fire) hydrant
DG	Dry goods
Drs	Doctor's office
Dwg	Dwelling
E	Open elevator
E Fl	Each Floor
El	Electric
Elec	Electrician
Eng	Engine
Ent	Entertainment
Episc'l	Episcopal
ESC	Elevator with self-closing traps
ET	Elevator with traps
Exch	Telephone exchange
Expr	Express (as used to designate a delivery service)
F	Flat (as used to designate a delivery service)
FA	Fire alarm
FE	Fire escape
F Pump	Fire pump
Fill'g Sta	Filling station, or gas station
Fl	Floor
Fr Attic	Frame constructed attic
Frat	Fraternity
Fur	Furnishings
Furn'g	Furnishings
Furne	Furniture
GAR	Grand Army of the Republic
GT	Gasoline tank
Gal	Gallery
Gall	Gallery
Gall'y	Gallery
Gen'l	General (as used to designate a general store)
Gents	Gentlemen's
Greas'g	Greasing
Gro	Grocery or groceries

Abbreviation	Meaning
H PFS	High pressure fire service
H'dw	Hardware
Hack	Hackney or delivery service
Hardw	Hardware
Ho	Hotel or house (as used to designate a warehouse)
Htr	Heater
Hyd	Hydrant
ICRR	Illinois Central Railroad
Imp	Implements
Ins	Insurance
Inst	Instruments
Ir Cl	Iron clad
K of C	Knights of Columbus
Lab	Laboratory
Lodg'g	Lodging
Luth	Lutheran
Luth'n	Lutheran
ME	Methodist Episcopal
Mach'y	Machinery
Mak'r	Maker
Manf'y	Manufactory or factory
Mdse	Merchandise
Mf'y	Manufactory or factory
Mill'y	Millinery
Mkg	Making
Mo	Motor
N S	Not sprinklered
O/U	Open under
Off	Office
PO	Post office
Paint'g	Painting
Pat Med	Patent medicines
Plumb'g	Plumbing
Print'g	Printing
QH	Quadruple (fire) hydrant
RC	Roman Catholic
R'f	Roof
R'm	Room
Rep	Repair
Rep'g	Repairing
Repos'ry	Repository
Rest'r't	Restaurant
Rf	Roof
Rm	Room
S	Store
SA	Spark arrestor
S Vac	Store portion of building is vacant
Sal	Saloon
Sky'ts	Skylights
Sm	Smith, as in gunsmith or blacksmith
Sm Ho	Smokehouse
Sprk'rs	Sprinklers
Stg	Storage
Sty	Story
Sta	Station
Stat'y	Stationery
TH	Triple (fire) hydrant
Tel	Telephone
Tenem'ts	Tenements
TESC	Tile enclosed elevator with self-closing traps
Tinw	Tinware
Trimm'g	Trimming
U	Upright
Up	Upright
VP	Vertical pipe
Vac	Vacant
Ven'd	Veneered
Ven'd	Veneered
W	Ware, as in warehouse or wareroom
WC	Water closet or toilet
WG	Wire glass skylights
W Ho	Warehouse
WPA	Works Progress Administration
W'ks	Works
Whol	Wholesale
Wkg	Working
Woodwkg	Woodworking



Above Figures, key for the Sanborn maps provided byhttp://web.mit.edu/thecity/resources/abbreviations_for_sanborn_maps.pdf

which resulted in again clearing the river of all obstructions like the aforesaid.

The amount that can be profitably expended in the fiscal year ending June 30, 1887, is $7,500, with which it is expected to still further aid navigation and commerce by dredging shoals and removing obstructions as they form. This is expected to complete the improvement as estimated, securing a channel 9 feet deep and 60 feet wide at low water. Small appropriations will be required from time to time in order to maintain the work, as it is not susceptible of entire and permanent completion, being a log-bearing stream.

July 1, 1884, amount available	$866 10
July 1, 1885, amount expended during fiscal year, exclusive of outstanding liabilities July 1, 1884	418 50
July 1, 1885, amount available	447 60
Amount (estimated) required for completion of existing project	7,500 00
Amount that can be profitably expended in fiscal year ending June 30, 1887	7,500 00
Submitted in compliance with requirements of section 2 of river and harbor acts of 1866 and 1867.	

(See Appendix L 10.)

11. *Pamplico and Tar rivers, North Carolina.*—The Pamplico River was originally obstructed by a war blockade of piling near Hill's Point, and also by stumps and shoals just below Washington. The Tar River was likewise obstructed by a war blockade of piling near Washington, and also by shoals and snags farther up, which made navigation difficult and uncertain.

The original projects for the improvement of these rivers contemplated removing these obstructions, and also widening, deepening, and straightening the channel of the Pamplico River below Washington, by dredging.

Previous to the act of June 14, 1880, the appropriation for them were distinct and separate. Since then they have been consolidated in one appropriation.

The amount expended to June 30, 1884, is $45,666.33, and resulted in a channel 9 feet deep at low water, and from 108 to 175 feet wide, from the deep water of Pamplico River to Washington, 1½ miles. Nothing further is desired except to widen the channel, which it is not proposed to do at present.

On the Tar the work resulted in a navigable channel 3 feet deep at low water, from Washington to Greenville, 23 miles, the year round, and thence to Tarboro', 26 miles, only during high water.

The amount expended in the fiscal year ending June 30, 1885, is $3,749.83, which was all expended on the Tar River and applied to the removal of logs, stumps, snags, and overhanging growth. A further slight improvement was effected thereby.

There will be but a small balance on hand at the close of the fiscal year ending June 30, 1886. The amount that can be profitably expended during the fiscal year ending June 30, 1887, is $5,000. It is proposed to apply this to continuing the improvement by removing snags, shoals, overhanging growth, &c., and the repair and construction of jetties, for the furtherance of navigation and commerce.

The work of improvement contemplated in the original estimates upon the Tar River is complete, but more work is needed. It is not susceptible of entire and permanent completion, as the jetties require repairs, and logs, snags, &c., are constantly appearing. A continuance

(USACE Annual Report 1885:161) used in 1885 results

of its best possible condition requires an annual expenditure of $5,000 to maintain it.

July 1, 1884, amount available		$2,333 67
Amount appropriated by act approved July 5, 1884		5,000 00
		7,333 67
July 1, 1885, amount expended during fiscal year exclusive of outstanding liabilities July 1, 1884	$3,749 83	
July 1, 1885, outstanding liabilities	1,120 94	
		4,870 77
July 1, 1885, amount available		2,462 90
Amount that can be profitably expended in fiscal year ending June 30, 1887 Submitted in compliance with requirements of section 2 of river and harbor acts of 1866 and 1867.		5,000 00

(See Appendix L 11.)

12. *Yadkin River, North Carolina.*—Originally there was no navigable channel whatever, as the river was obstructed by numerous shoals, rock ledges, and mill-dams. It was contemplated to improve the portion of the river from the North Carolina Railroad Bridge near Salisbury up to the foot of Bean Shoals, 64½ miles, over which it was proposed to obtain a low-water channel the entire year from 2½ to 3 feet in depth and of ample width for the trade seeking it. To accomplish this the project was to blast and remove the rock, construct jetties, and take out the mill-dams. No locks were contemplated.

Up to June 30, 1884, there was expended $53,701.40, which resulted in securing an indifferent channel from 40 to 70 feet wide, and from 2 to 2½ feet deep for eight months of the year, the season of "winter water," from the North Carolina Railroad Bridge to Swicegood's Mill-dam, 21½ miles.

In the fiscal year ending June 30, 1885, there was expended $8,574.65, which was applied to that part of the river between Barnes' Shoal and Swicegood's Mill-dam, 5½ miles, in the construction of wing-dams and training-walls, and the removal of rock ledges. This resulted in further improving the channel for navigation at winter stage; at the lowest stage there is no continuous navigable channel, it being but 9 inches deep at one point, Boone's Ford.

The act of July 5, 1884, provides: "That the sum of $6,000, authorized by the act approved June 14, 1880, to be expended for the removal of dams in Yadkin River, North Carolina, may be used by the Secretary of War for acquiring the right of way by removal or otherwise of such dams as may be necessary for the contemplated improvement, the said right of way or removal to be obtained by agreement with the parties interested, or in event of failure, to make a reasonable agreement by condemnation, as provided for by the laws of the State of North Carolina."

It is questionable whether any of this will be necessary, as recent investigations of the local engineer show that the dams can all be best and most economically passed by wing-dams and training-walls, or by locks, as the case may be. Accordingly, this amount will be held for the present, and the balance of the funds available will be devoted to securing a navigable channel at least 2½ feet deep and 60 feet wide at winter stages only from the North Carolina Railroad Bridge to Hartley's Mill-dam, 28 miles, by the construction of wing-dams and training-walls and the removal of rock ledges.

It would be very expensive to make low-water navigation on this

(USACE Annual Report 1885:162) used in 1885 results

L 10.

IMPROVEMENT OF MEHERRIN RIVER, NORTH CAROLINA.

The operations consisted in again clearing the entire navigable portion of the river, 11 miles of obstructions during the month of March. The following were removed: 44 overhanging trees, 12 sunken trees, 57 mill-logs, and 6 snags. This work was done by hired labor and machinery. The river was inspected and found to be in good condition with the exception of two shoals, with a minimum depth of 8 feet of water thereon, that required dredging.

It is proposed to expend future appropriations in dredging and in removing obstructions, like those above, that will continue to form.

A portion of the commercial statistics will be found in report for this fiscal year, on the Black Water River. There are more, as other lines of boats ply there, but they could not be obtained, although applied for.

The Meherrin River is in the second collection district of North Carolina.

Money statement.

July 1, 1884, amount available	$866 10
July 1, 1885, amount expended during fiscal year, exclusive of outstanding liabilities July 1, 1884	418 50
July 1, 1885, amount available	447 60
Amount (estimated) required for completion of existing project	7,500 00
Amount that can be profitably expended in fiscal year ending June 30, 1887	7,500 00
Submitted in compliance with requirements of section 2 of river and harbor acts of 1866 and 1867.	

L 11.

IMPROVEMENT OF PAMPLICO AND TAR RIVERS, NORTH CAROLINA.

The act of July 5, 1884, appropriated $5,000 for this work. A project for the expenditure thereof was submitted to the Chief of Engineers and duly approved. In accordance therewith proposals were invited for building a combined steam-hoister and pile-driver for use on this work, and also on North Landing River, to be paid for from the funds available for each, share and share alike. All bids received therefor were rejected as excessive, and authority was granted to build the same by hired labor and the purchase of materials in open market. The construction of this has been commenced accordingly. It drew 8 inches when launched and will shortly be finished. It will be provided with pump for water-jet and fully equipped for work.

The following was done by the hire of labor and machinery and the purchase of materials in open market: Commencing at a point 11 miles below Tarborough, the river was cleaned for a distance of 8½ miles, or to within 7 miles of Greenville. For this purpose 650 logs, 106 stumps, 617 snags, 5 bridge-piles, one large sunken flat, and 149 leaning trees were removed.

An examination of the river was made, which shows it to be in the following condition: Of the forty-one jetties twenty-five were in good order, and the balance not. As a rule they have proved of benefit to navigation, but more will be required to complete the project. Some have been damaged by steamers striking them at high water, for which reason piles should be placed at the ends thereof to mark them. The

(USACE Annual Report 1885:1041) used in 1885 results

best jetties are those composed of two rows of piles, filled in with logs, &c. No work has been done on jetties since 1882. There are yet many overhanging trees along this river, and many logs, snags, &c., to be removed. The bridges at Greenville and Sparta collect large quantities of drift, which causes shoals and rapids to form to the detriment of navigation. Clear span-bridges should be substituted therefor. Steamers run regularly from Washington to Greenville the year round, and thence to Tarborough only during high water.

For this fiscal year the following commercial statistics have been received from the Clyde and Old Dominion Steamship Companies:

Bales of cotton		27,054
Rice	barrels	5,343
Shingles		917,029
Naval stores	barrels	4,732
Potatoes		8,115
Lumber	feet	94,686
Miscellaneous packages		22,842
Aggregate tons of merchandise shipped		9,552,697

Money statement.

July 1, 1884, amount available		$2,333 67
Amount appropriated by act approved July 5, 1884		5,000 00
		7,333 67
July 1, 1885, amount expended during fiscal year, exclusive of outstanding liabilities July 1, 1884	$3,749 83	
July 1, 1885, outstanding liabilities	1,120 94	
		4,870 77
July 1, 1885, amount available		2,462 90
Amount that can be profitably expended in fiscal year ending June 30, 1887 Submitted in compliance with requirements of section 2 of river and harbor acts of 1886 and 1867.		5,000 00

Abstract of proposals received for furnishing and delivering a combined steam-hoister and pile-driver for Pamplico and Tar rivers, North Carolina, and North Landing River, Virginia and North Carolina, opened by Capt. F. A. Hinman, Corps of Engineers, at Norfolk, Va., April 17, 1885.

No.	Names and addresses of bidders.	Time for delivery.	Price.
1	Peter H. Brickhead, Toledo, Ohio	According to specifications	$6,200
2	L. G. Ferris, Baltimore, Md	According to specifications	4,375
3	Wm. E. Woodall, Baltimore, Md	In seventy days after acceptance of bid	9,000
4	The Pusey and Jones Company, Wilmington, Del.	According to specifications	6,325

All bids rejected as being excessive.

L 12.

IMPROVEMENT OF YADKIN RIVER, NORTH CAROLINA.

The operations were confined to the 5½ miles of the river-front from Barnes's Shoal up to Swicegood's Mill Dam.

At Barnes's Shoal one wing-dam was completed and four more built, aggregating 365 linear feet; at Big Rock Shoal 513 cubic yards of rock were blasted and removed from the channel, a portion being used for a revetment along the left bank, and the balance for a dam 110 feet long across

(USACE Annual Report 1885:1042) used in 1885 results

The original project of 1889, as continued to date, proposed to clear out all the natural obstructions in the river up to Bellamy Mill, such as snags, fallen trees, leaning trees, overhanging trees, etc. The total final cost of this work was estimated in 1889 at $25,000.

Up to the 30th of June, 1890, no funds had been appropriated and no work done. No results can be expected before 1892.

During the fiscal year ending 30th June, 1891, no funds were spent upon this improvement, waiting until the obstructing bridges have all been withdrawn, removed, or provided with draws.

After the river is once thoroughly cleared its proper maintenance may cost from $1,000 to $2,000 per year.

Amount appropriated by act approved September 19, 1890	$10,000.00
July 1, 1891, balance unexpended	10,000.00
Amount (estimated) required for completion of existing project	15,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1893	10,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867.	

(See Appendix L 6.)

7. *Pamlico and Tar rivers, North Carolina.*—The Pamlico and Tar rivers are different portions of a single stream, the upper portion being called the Tar.

When placed under improvement in 1876, the Pamlico River had an available depth of only 3 feet at low water in its upper portion, near Washington. The Tar River had, during 8 months of the year, an available depth of from 2 to 3 feet for 48 miles up to Tarboro, its practical limit of navigation. The channel of the combined stream was almost completely obstructed by two war blockades, and by floating and sunken stumps and logs, and by overhanging trees.

The original project of 1876 (for the Pamlico) and of 1879 (for the Tar), as since slightly modified and continued to date, proposed to secure a clear channel 9 feet deep at low water up to Washington; thence a channel 60 feet wide and 3 feet deep at low water, 22 miles farther, to Greenville; and thence a channel 60 feet wide and 20 inches deep, 58 miles farther, to Tarboro and Rocky Mount Little Falls. The final total cost of this work was estimated in 1889 at $92,200.

Up to June 30, 1890, a total of $66,227.90, including outstanding liabilities, had been spent upon this improvement in securing a good channel at least 9 feet deep at low water, and at least 108 feet wide from Pamlico Sound up to Washington; thence a fair channel 60 feet wide and 3 feet deep all the year, to Greenville; and thence a similar channel for 8 months of the year, to Tarboro.

During the fiscal year ending June 30, 1891, an additional $2,565.23, including outstanding liabilities, was spent on this improvement in minor field work, and in surveys to be used in locating future work.

After the improvement is finished its proper maintenance may cost from $1,000 to $3,000 per year.

July 1, 1890, balance unexpended	$1,873.55
Amount appropriated by act approved September 19, 1890	10,000.00
	11,873.55
June 30, 1891, amount expended during fiscal year	2,617.34
July 1, 1891, balance unexpended	9,256.21
July 1, 1891, outstanding liabilities	49.34
July 1, 1891, balance available	9,206.87

(USACE Annual Report 1891:157) used in 1891 results

Amount (estimated) required for completion of existing project	$14,200.00
Amount (estimated) required for completion of new project	45,000.00
	59,200.00
Amount that can be profitably expended in fiscal year ending June 30, 1893	30,000.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867.	

(See Appendix L 7.)

8. *Contentnia Creek, North Carolina.*—When placed under improvement in 1881 this stream had a depth of about 3 feet during 9 months of the year, from its mouth in the Neuse upwards about 63 miles to Stantonsburg, its practical limit of navigation; but its channel was completely blocked at all stages of water by sunken logs and stumps, and by floating obstructions.

The original project of 1881, as continued to date, proposed to secure a safe and unobstructed 3-foot navigation over this distance during the high-water season of about 9 months. The final total cost of this work was estimated in 1888 at $77,500.

Up to June 30, 1890, a total of $43,928.52, including outstanding liabilities, had been spent in securing a moderately well-cleared 3-foot navigation over the 31 miles from its mouth up to Snow Hill, and a roughly cleared 3-foot navigation over 32 miles farther to Stantonsburg, during the high-water season.

During the fiscal year ending June 30, 1891, an additional $4,772.98, including outstanding liabilities, was spent upon this improvement for minor field work, surveys, and office work.

After the improvement is finished its proper maintenance may cost from $1,000 to $3,000 per year.

July 1, 1890, balance unexpended	$1,124.98
Amount appropriated by act approved September 19, 1890	7,000.00
	8,124.98
June 30, 1891, amount expended during fiscal year	4,536.08
July 1, 1891, balance unexpended	3,588.90
July 1, 1891, outstanding liabilities	290.40
July 1, 1891, balance available	3,298.50
Amount (estimated) required for completion of existing project	25,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1893	25,500.00
Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867.	

(See Appendix L 8.)

9. *Trent River, North Carolina.*—When placed under improvement in 1879 this river had a 6-foot to 8-foot roughly cleared navigation from its mouth at New Berne, up 18 miles to Pollocksville, and a light-draft navigation 7 miles farther to Quaker Bridge. Above Pollocksville the bars, snags, and trees prevented all navigation, except occasionally by small flatboats during high freshets.

The original projects of 1879 to 1889, as continued to date, assumed that 6 to 8 feet of water could be carried at all stages from its mouth 18 miles to Pollocksville, and proposed to secure a thoroughly cleared 3-foot navigation, with at least 50 feet channel width at all stages of water from Pollocksville, 20 miles up, to Trenton, and at least 30 feet channel width and over 3 feet depth during winter stages of water from Trenton, 30 miles up, to the Narrows above Free Bridge, and a good channel for pole-boats 13 miles farther to Upper Quaker Bridge. The total final cost of this work was estimated in 1889 at $72,000.

(USACE Annual Report 1891:158) used in 1891 results

EXAMINATIONS FOR IMPROVEMENT, TO COMPLY WITH REQUIREMENTS OF RIVER AND HARBOR ACT APPROVED SEPTEMBER 19, 1890.

The required preliminary examinations of the following localities were made by the local engineer in charge, Captain Bixby, and reports thereon submitted through Col. Wm. P. Craighill, Corps of Engineers, Division Engineer, Southeast Division. It is the opinion of Captain Bixby, and of the Division Engineer, based upon the facts and reasons given, that these localities are not worthy of improvement. The conclusions of these officers being concurred in by me, no further surveys of these localities were ordered. The reports were transmitted to Congress and printed as executive documents of the Fifty-first Congress, second session.

1. *Water-way from Pungo River to the town of Sladesville, North Carolina.*—Printed as House Ex. Doc. No. 160. (See also Appendix L 25.)

2. *Water-way between Pamlico River and Bay River, North Carolina.*—Printed as House Ex. Doc. No. 162. (See also Appendix L 26.)

3. *Drum Inlet, North Carolina.*—Printed as House Ex. Doc. No. 164. (See also Appendix L 27.)

The required preliminary examinations of the following localities were made by the local engineer in charge, Captain Bixby, and reports thereon submitted through Col. Wm. P. Craighill, Corps of Engineers, Division Engineer, Southeast Division. It is the opinion of Captain Bixby, and of the Division Engineer, based upon the facts and reasons given, that these localities are worthy of improvement. The reports of the preliminary examinations containing sufficient information to indicate to Congress the probable cost of the work required, no further surveys appear to be necessary at this time. The reports were transmitted to Congress and printed as executive documents of the Fifty-first Congress, second session.

1. *Harbor of Washington, Pamlico River, North Carolina.*—The proposed improvement contemplates dredging a channel 200 feet wide and 9 feet deep at ordinary low water, at an estimated cost of $45,000. Printed as House Ex. Doc. No. 289. (See also Appendix L 28.)

2. *White Oak River, North Carolina, from Roberts' Landing to Collins Crossing.*—The work proposed consists in providing for steamboat navigation from Robert's Landing to Sabiston's Bridge, 4 miles, and for flat-boat navigation from Sabiston's Bridge to Collins Crossing, 21 miles, at an estimated cost of $4,550. Printed as House Ex. Doc. No. 97. (See also Appendix L 29.)

3. *Black River, South Carolina, from Kingstree to its mouth.*—The proposed improvement contemplates the removal of such obstructions as snags and fallen and overhanging trees, from its mouth upward 118 miles to the railroad bridge at Kingstree, at an estimated cost of $25,000. Printed as House Ex. Doc. No. 286. (See also Appendix L 30.)

IMPROVEMENT OF LUMBER AND WACCAMAW RIVERS, NORTH CAROLINA AND SOUTH CAROLINA, AND OF CERTAIN RIVERS AND HARBORS IN SOUTH CAROLINA.

Officer in charge, Capt. Frederic V. Abbot, Corps of Engineers, with Lieut. E. J. Spencer, Corps of Engineers, under his immediate orders to August 12, 1890; Division Engineer, Col. Wm. P. Craighill, Corps of Engineers.

1. *Waccamaw River to Waccamaw Lake, North Carolina and South Carolina.*—In 1880 this river was navigable for 12-foot draft boats at all stages of water from Georgetown, 23 miles to Bull Creek, and at high

(USACE Annual Report 1891:170) used in 1891 results

Two appropriations of about $12,000 each would clear out this river sufficiently to allow the passage of boats of 4 feet draft at average water, opening up a region of from 40,000 to 120,000 acres of good farming lands, with an already actual trade of $900,000 and a possible commerce of from $2,000,000 to $5,000,000 per year.

The present actual river commerce remains the same as that of December 31, 1890, viz, nothing, the actual improvement of this water-way not yet being commenced.

L 7.

IMPROVEMENT OF PAMLICO AND TAR RIVERS, INCLUDING TAR RIVER FROM TARBORO TO LITTLE FALLS, NORTH CAROLINA.

HISTORY OF PAST OPERATIONS.

(1) *References to past reports.*—For special description of Pamlico River, see pages 361–363, Annual Report for 1876, and pages 1130–1132, Annual Report for 1889; for history of work, see pages 649–651, Annual Report for 1879; and for map of river, see page 836, Annual Report for 1880, and page 1114 of Annual Report for 1890. For special description of Tar River, see pages 700–702, Annual Report for 1879; and for map of river, see page 1114, Annual Report for 1890.

For special description of the river above Tarboro, see pages 1130–1132, Annual Report for 1889, and for its map, see this present report.

(2) *Original condition.*—The Pamlico and Tar rivers are different portions of a single stream, the upper portion being called the Tar. The Tar has a total length of about 180 miles and a drainage area of 3,200 square miles, and changes its name to the Pamlico at the town of Washington, N. C. The Pamlico has a further length of about 37 miles and a further drainage area of 1,700 square miles, and finally widens out into Pamlico Sound. The combined rivers, therefore, have a total length of about 217 miles and a total drainage area of about 4,900 square miles.

When placed under governmental improvement in 1876, the Pamlico River had an available depth of only 3 feet at low water in its upper portion near Washington; thence the Tar River had, during 8 months of the year, an available depth of from 2 to 3 feet for 48 miles, up to Tarboro, its practicable limit of navigation; but the channel of the combined stream was almost completely obstructed by two war blockades and by floating and sunken stumps and logs, and by overhanging trees. Its steamboat commerce is now estimated to have then been about $500,000.

(3) *Plan of improvement.*—The two rivers have been considered by Congress, separately prior to 1880, but jointly ever since then. The original project of 1876 (for the Pamlico) and of 1879 and 1889 (for the Tar), as since slightly modified and continued to date, proposed to secure a clear and safe channel 9 feet deep at low water up to Washington; thence a channel 60 feet wide and 3 feet deep at low water for 22 miles farther to Greenville; and thence a channel 60 feet wide and 20 inches deep at low water for 26 miles farther to Tarboro, and thence 32 miles farther to Rocky Mount Little Falls. A personal inspection of the river in 1886 showed the agricultural richness of the river basin, its need of water transportation, and the worthiness of the improvement.

The total final cost of this work was estimated in 1889 to be $92,200.

The total amount appropriated for these projects up to June 30, 1891, is $78,000.

(USACE Annual Report 1891:1347) used in 1891 results

The funds on hand will be used up before new appropriations can become available.

(4) *Results.*—Up to June 30, 1890, a total of $66,227.90, including outstanding liabilities, had been spent in all upon this improvement; in securing a good channel at least 9 feet deep at low water and at least 108 feet wide from Pamlico Sound up to Washington; thence a fair channel 60 feet wide and 3 feet deep all the year to Greenville; and thence a similar channel 8 months of the year to Tarboro.

In consequence of this 13 steamers ran regularly to Washington, thence 4 steamers ran 3 times a week all the year to Greenville, and 8 months of the year to Tarboro. The present commerce was rapidly increasing and was then about $4,600,000 of goods transported per year, showing that each dollar once spent upon this improvement had been accompanied by a development of about $64 in annual commerce. Besides this, the rates of freight are estimated to have been lowered between 12 and 50 per cent. since the commencement of the improvement.

The navigation of this river was not obstructed by bridges without draws below Tarboro.

Bridges above Tarboro will probably be provided with draws as soon as the river is well cleared of its obstructions.

PRESENT OPERATIONS.

(5) *Work of past year.*—The special work of the past year is as follows: Expenditures, $2,565.23, including outstanding liabilities; value of plant, $1,545.

Owing to the difficulty of properly specifying it beforehand and measuring it afterwards, all work was, for advantage and economy, allowably done by hired labor and the purchase of materials in open market.

Active work was suspended in June, 1889, to await more funds and a more favorable stage of water for snagging.

While not needed on this river, its United States property was used for a time on the Neuse River, and then stored and cared for on that stream.

The river from Tarboro to Rocky Mount Little Falls was surveyed and mapped.

Mile posts were established over the entire length of river to serve as points of reference in reporting obstructions and laying out work.

The river at and just below Washington was surveyed with reference to securing a better channel below Washington (see map herewith, and see also special report further on marked Appendix 28). The results of this survey show $45,000 more of work necessary below Washington to obtain the depths of the original approved project of 1879 and following years.

Four water-gauges have been kept during the year.

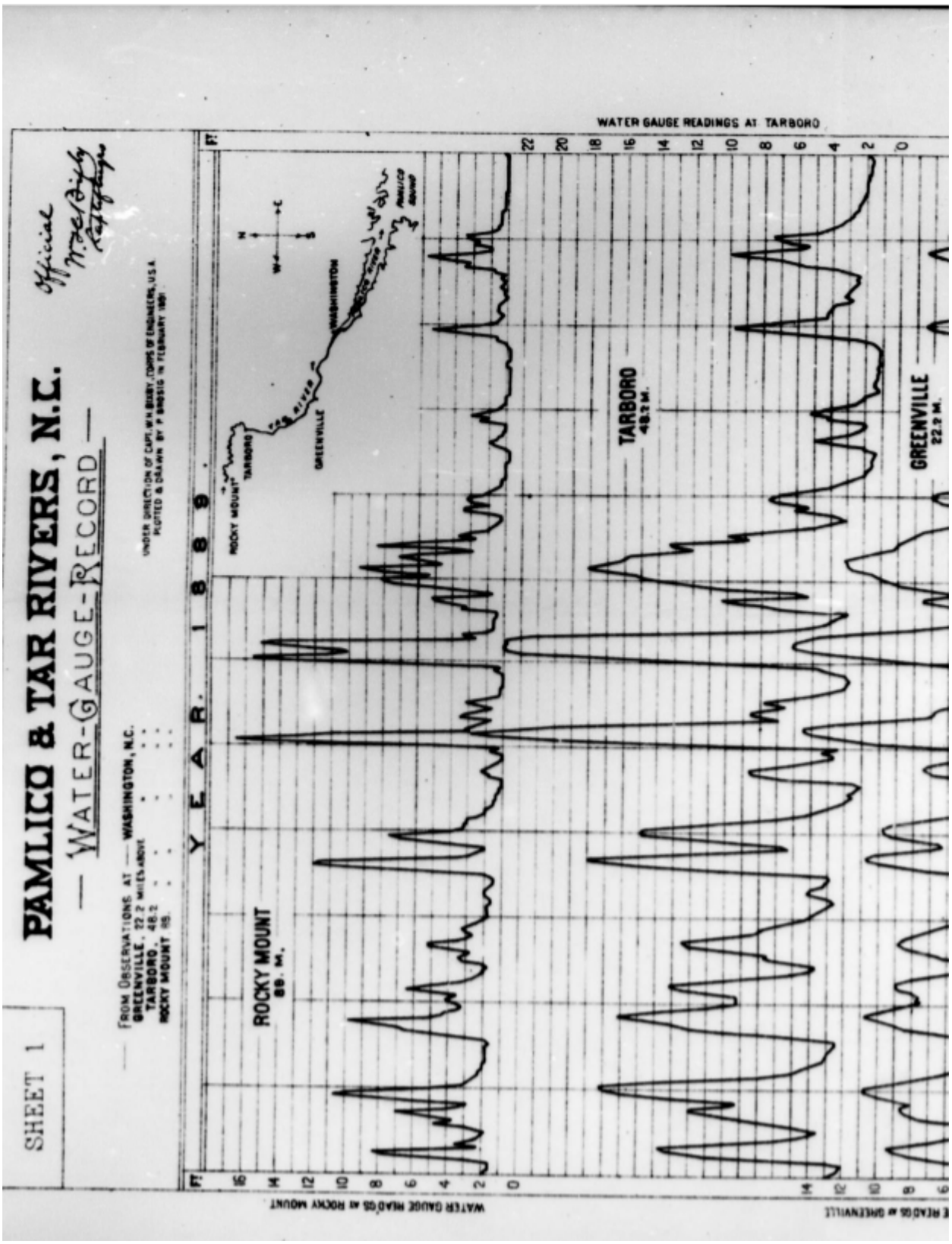
Inspections of plant and work have been made during the year.

This improvement has been under the immediate supervision of Superintendent R. Ransom, whose report is herewith appended.

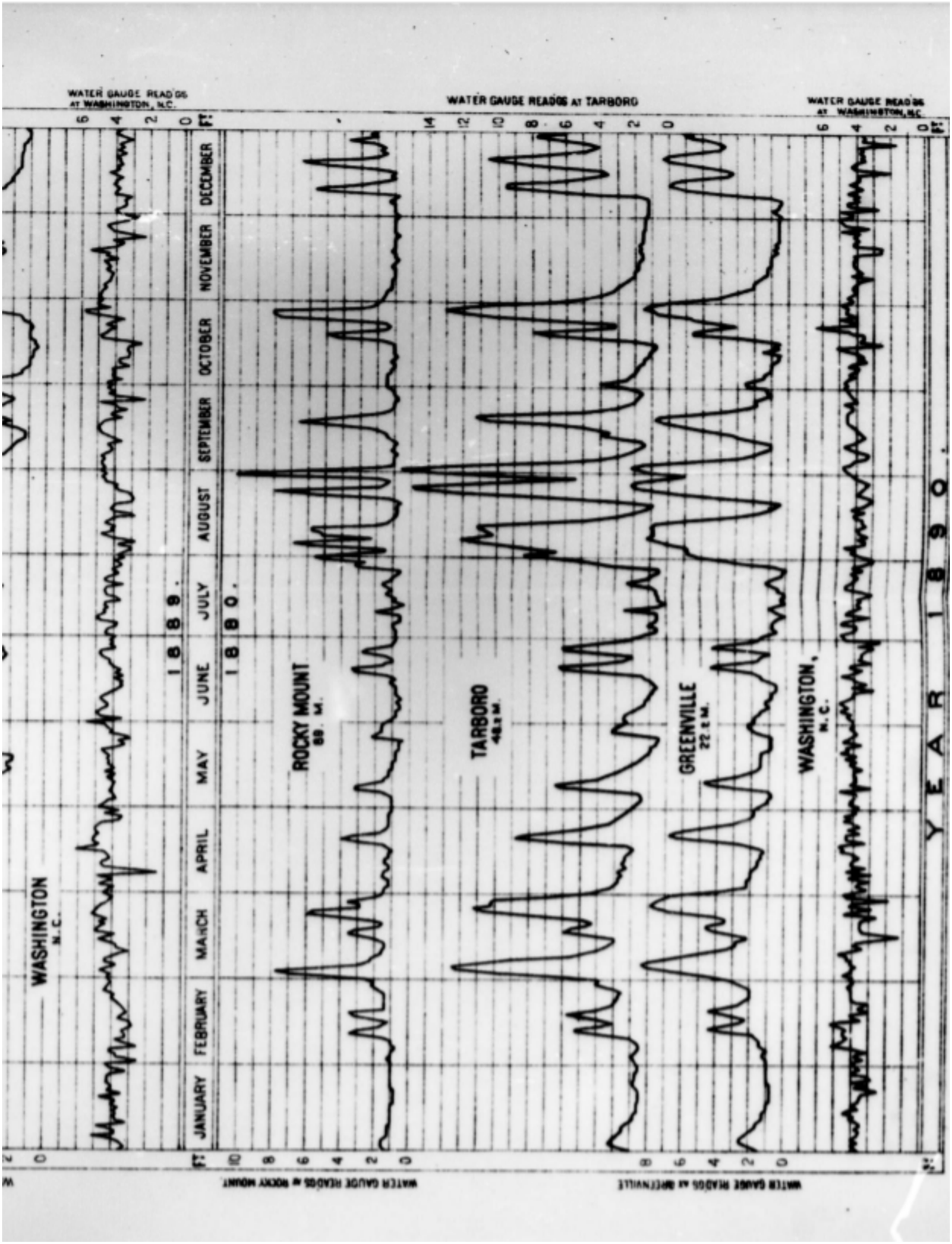
The existing fair navigable condition of the river below Tarboro has been maintained, and the 23 miles of the river above Tarboro heretofore opened have been used by steamers of 3-foot draft during 8 or 9 months of the year. The river commerce is steadily increasing. Otherwise the situation remains about the same as at the beginning of the fiscal year.

The latest reliable commercial statistics, those for the year ending

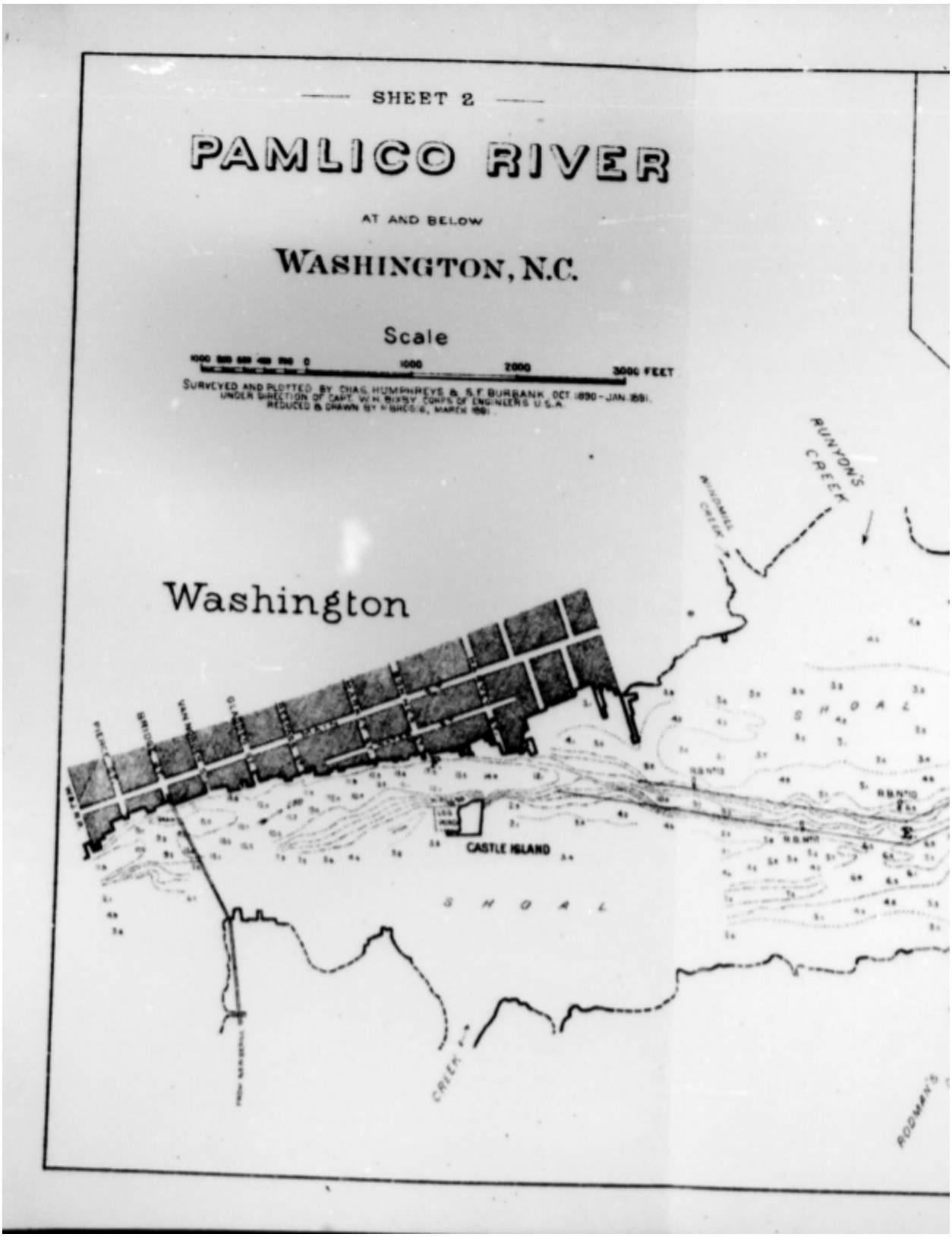
(USACE Annual Report 1891:1348) used in 1891 results



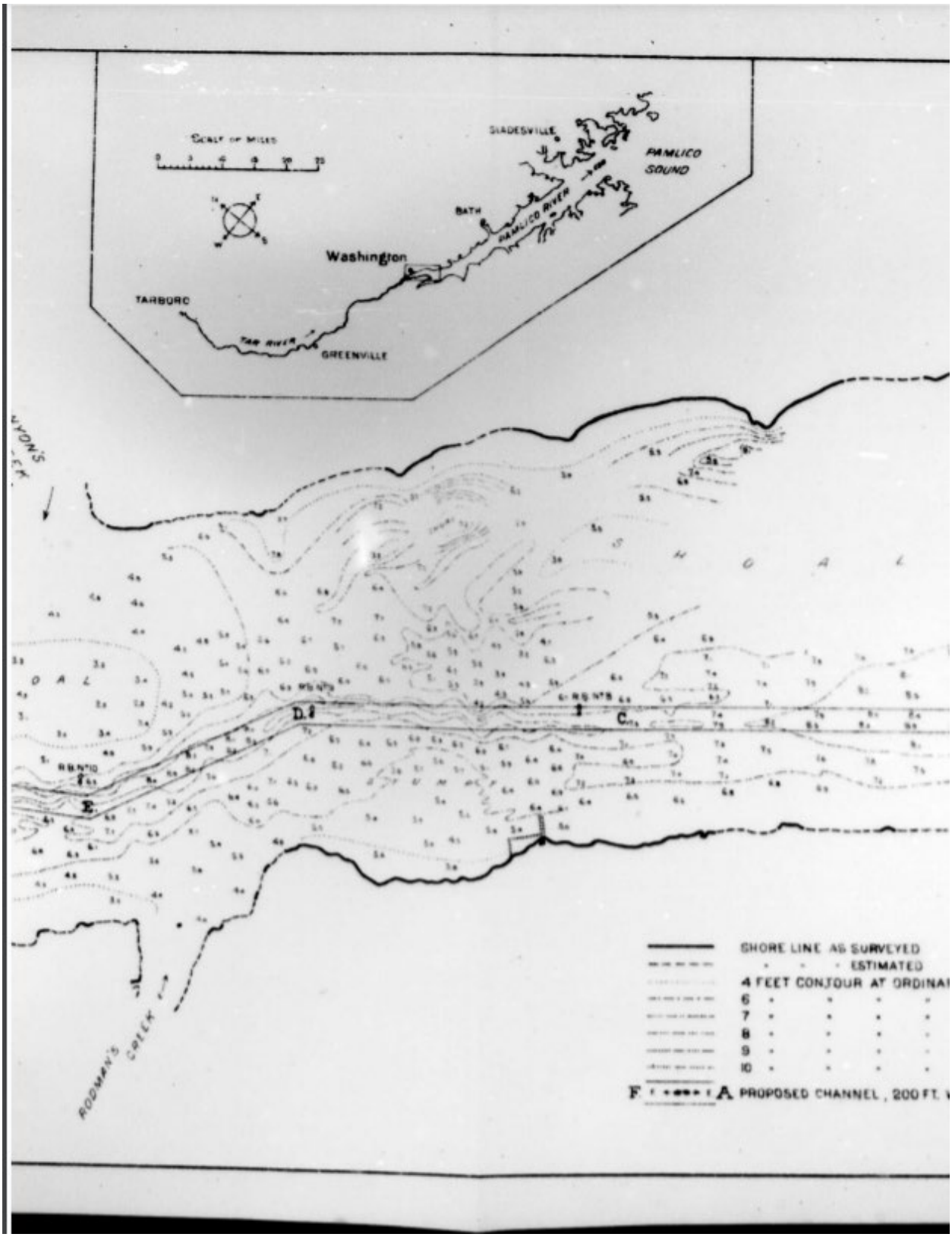
(USACE Annual Report 1891) used in 1891 results



(USACE Annual Report 1891) used in 1891 results



(USACE Annual Report 1891) used in 1891 results



(USACE Annual Report 1891) used in 1891 results

December 31, 1890, are herewith appended, showing a commerce of $6,742,475 per year (about 277,832 tons).

(6) *Recommendations for future work.*—It is recommended that this improvement be completed in accordance with the present proposed and approved project, so as to secure a thoroughly cleared 9-foot navigation at low water up to Washington ($45,000, see appendix 28), a similar 3-foot navigation at low water up to Greenville, and thence a similar 3-foot channel during 8 months of the year up to Rocky Mount Little Falls, at a total expense of $59,200, in addition to the funds available June 30, 1891, this amount to be appropriated in yearly installments of as much as $30,000 until finished. Smaller appropriations may increase the cost by from $1,000 to $3,000 per year. Further improvement so as to extend this navigation above Rocky Mount Little Falls, or to make the river above Greenville navigable all the year round, is not recommended at present.

After the improvement is finished its proper maintenance may cost from $1,000 to $3,000 per year.

This river is in the collection district of Pamlico, N. C.

Money statement.

July 1, 1890, balance unexpended		$1,873.55
Amount appropriated by act approved September 19, 1890		10,000.00
		11,873.55
June 30, 1891, amount expended during fiscal year		2,617.34
July 1, 1891, balance unexpended		9,256.21
July 1, 1891, outstanding liabilities		49.34
July 1, 1891, balance available		9,206.89
Amount (estimated) required for completion of existing project	$14,200.00	
Amount (estimated) required for completion of new project	45,000.00	
		59,200.00
Amount that can be profitably expended in fiscal year ending June 30, 1893		30,000.00

Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867.

REPORT OF MR. R. RANSOM, SUPERINTENDENT.

UNITED STATES ENGINEER OFFICE,
New Berne, N. C., June 30, 1891.

CAPTAIN: I have the honor to submit the following report of operations for the improvement of Pamlico and Tar rivers during the present fiscal year.

This stream owns for its improvement only one hoister, owned in part by the Contentnia Creek, and this machine has been in use upon the Contentnia up to date since it was repaired early in the spring, and no operations have been attempted the present year.

By authority from you dated November 15, 1890, $8,000 was allotted to be expended upon this river.

Amounts expended during the past year are as follows:

Repairs to hoister	$103.57
Purchase of property	216.78
Gauge observations	30.00
Superintendence	439.79
Labor and supplies	67.85
Total	857.99

(USACE Annual Report 1891:1349) used in 1891 results

So soon as the machinery necessary for the prosecution of the work shall be free for use, and the state of water shall be favorable for its execution, operations will be actively started and continued until the appropriation shall be exhausted.

The increase in export tonnage over that for the preceding year is estimated, from the best reports which could be obtained, at nearly or quite 50 per cent. This is owing to the very poor crops of the preceding year, the excellent one of 1890, and the great increase in the lumber trade. No increase of imports is reported.

When the river shall have been improved up as far as it is deemed advisable, as shown by your reports, we have every reason to expect continued material benefits to follow, not less marked than that shown by past results.

Very respectfully, your obedient servant,

R. RANSOM,
Superintendent.

Capt. W. H. BIXBY,
Corps of Engineers, U. S. A.

COMMERCIAL STATISTICS.

When work commenced in 1876, the river was irregularly navigated by 3-foot draft steamers up to Tarboro. The commerce is estimated to have then been about $500,000 of goods transported per year. The present commerce is about $6,700,000 of goods transported per year.

Seventeen steamers now ascend the river regularly 37 miles to Washington, and four others make regular trips to Greenville, 23 miles farther, during the whole year, and 26 miles farther to Tarboro during the flush-water season. One of the steamers that usually runs from Baltimore to Washington, N. C., has made a trip to Tarboro and return without hinderance, drawing 6½ feet of water.

Three-masted schooners with cargoes of ice from the North have also been towed to Greenville to deliver cargoes without breaking bulk.

The present rates of freight are estimated to be from 12 to 50 per cent. less than in 1876.

The river marine insurance is now about one-tenth of 1 per cent.

The commerce is rapidly increasing. Each dollar so far spent on this improvement has been accompanied by the development of about $92 of annual commerce. Washington, N. C., has developed rapidly, and since 1882 the value of its taxable property has increased more than 25 per cent. Greenville had increased from 912 inhabitants and $266,000 real estate in 1880, up to 2,500 inhabitants and $600,000 real estate in 1886, and is still growing rapidly. The development of these towns is almost entirely due to the Government improvement of the river since 1876. This improvement is beneficial not only in this neighborhood, but to the country at large, since the lumber and cotton brought down the river are sent all over the United States, and even to many foreign countries, whence by exchange they return in the form of ice, dry goods, meat, flour, farming tools, etc., an exchange almost entirely due to the lessened freight charges resulting from the recent improvement of the water transportation of this particular stream. It is estimated that the continuation of the present improvement will be followed by a continuation of this rapid development of commerce.

The commerce for the year ending 31st December, 1890, is estimated as follows:

Class of goods.	Exports.	Imports.	Total.	Tonnage.
Cotton and products	$1,220,500	.....	$1,220,500	6,900
Rice	100,600	.....	100,600	2,050
Vegetables and truck	100,000	.....	100,000	4,500
Live stock and products	51,375	.....	51,375	625
Fish, oysters, etc	250,000	.....	250,000	14,000
Naval stores	20,000	.....	20,000	2,400
Lumber and products	1,800,000	.....	1,800,000	225,000
General merchandise	200,000	$3,000,000	3,200,000	22,357
Total	3,742,475	3,000,000	6,742,475	277,832

Gain over last year, $2,071,665; tons, 99,112.

Transportation lines established during year, none.

The above statistics are based mainly upon reports of Superintendent R. Ransom,

(USACE Annual Report 1891:1350) used in 1891 results

fit of the neighboring country, otherwise without transportation facilities for its products. The work above Snow Hill, though of very recent date, had already produced good results. The commerce (including rafted goods) was rapidly increasing, and was then above $1,200,000 of goods transported per year, showing that each dollar once spent on the improvement has been accompanied by the development of about $28 in annual commerce.

The navigation of this river was not obstructed by bridges without draws, except where under repair.

PRESENT OPERATIONS.

(5) *Work of the past year.*—The special work of the past year is as follows: Expenditures, including outstanding liabilities, $4,772.98; value of United States plant, $3,600.

During low water of July, 1890, some work was advantageously done at Spring Slough, near the mouth of the river, and from February to June, 1891, inclusive, the snagging plant did continuous work over 21 miles of river above Snow Hill (from 52 to 31 miles above the river mouth) and occasional work below, removing from the banks 728 trees cut and pulled back, 245 cords brush, 407 logs rolled back, and 82 stumps removed; and from the channel, 454 logs, 102 stumps, 519 large snags, 29 small snags, 120 trees, 132 cubic yards mud, and 34 trees trimmed. All work of snagging and bank trimming was much interfered with by continued high water.

Mile posts were established over the entire length of river to serve as points of reference in reporting obstructions and laying out work.

A small reserve has been retained for special snagging and emergencies.

Water gauges have been kept a three places during the year.

Inspection of property and work has been made during the year.

This improvement has been under the immediate supervision of Superintendent R. Ransom, whose report is herewith appended.

The steamboat navigation is still much obstructed by snags and sunken logs. The commerce has steadily increased, and it is believed that there will be a still larger increase when the river is thoroughly cleared. Otherwise, the situation remains about the same as at the beginning of the fiscal year.

The latest reliable commercial statistics, those for the year ending December 31, 1890, are herewith appended, showing a commerce of $1,342,100 per year, about 125,225 tons.

(6) *Recommendations for future work.*—It is recommended that this improvement be completed in accordance with the present proposed and approved project, so as to secure a thoroughly cleared 3-foot navigation over the entire river from its mouth upward to Stantonsburg during the nine commercial busy months of the year, at a total expense of $25,500 in addition to the funds available June 30, 1891, this amount to be appropriated in a single sum. Smaller appropriations may increase the cost by from $1,000 to $4,000 per appropriation. Further improvement, so as to extend this navigation above Stantonsburg, or so as to make any part of the river navigable during the low-water season, is not recommended at present.

After the improvement is finished its proper maintenance may cost from $1,000 to $3,000 per year.

This river is in the second collection district of North Carolina.

(USACE Annual Report 1891:1352) used in 1891 results

made after much correspondence and conversation with steamboat captains and agents, custom-house officials, and prominent shippers and merchants.

	Amount.	Tons.
The commerce at present as above shown is	$6,742,475	277,832
The commerce before the improvement began was	500,000	*21,000
The development of commerce since beginning of the improvement is	6,242,475	256,832
Expended on improvement up to 31st December, 1890	67,984	.....
The development of annual commerce for every dollar spent on the improvement is	92	.....

* Estimated.

L 8.

IMPROVEMENT OF CONTENTNIA CREEK, NORTH CAROLINA.

HISTORY OF PAST OPERATIONS.

(1) *References to past reports.*—For special description of river, see pages 1010–1012, Annual Report for 1881; for special history of past work, see page 975, Annual Report for 1886; for map of river, see page 1118, Annual Report for 1890.

(2) *Original condition.*—Contentnia Creek, a tributary of the Neuse River, has a total length of about 44 miles, and a drainage area of 1,184 square miles.

When placed under governmental improvement in 1881, this stream had a depth of about 3 feet during 9 months of the year, from its mouth in the Neuse upward about 63 miles to Stantonsburg, its practical limit of navigation; but its channel was completely blocked at all stages of water by sunken logs and stumps and by floating obstructions. Its steamboat commerce was then nothing.

(3) *Plan of improvement.*—The original project of 1881, as continued to date, proposed to secure a safe and unobstructed 3-foot navigation over this entire distance during the high-water season of about 9 months. A personal examination of the river over its entire length in 1884–'85 revealed the agricultural richness of the river basin, its urgent need for better transportation facilities, and the worthiness of the improvement.

The total final cost of this work was estimated in 1888 to be $77,500.

The aggregate amount appropriated for this project up to June 30, 1891, is $52,000.

The funds now on hand will be used up before new appropriations can become available.

(4) *Results.*—Up to 30th June, 1890, a total of $43,928.52, including outstanding liabilities, had been spent in all upon this improvement in securing a moderately well cleared 3-foot navigation over the 31 miles from its mouth up to Snow Hill, and a very roughly cleared 3-foot navigation over the remaining 32 miles to Stantonsburg during the high-water season.

In consequence of this, two steamboats had made trips twice a week a short distance up the river, and two more up to Snow Hill during nearly 9 months each year, the river above Snow Hill was fairly navigable for steamers of 3-foot draft for 8 or 9 months of the year, and flats also plied between Snow Hill and Stantonsburg, to the great bene-

(USACE Annual Report 1891:1351) used in 1891 results

vicinity to begin the cut above mentioned is probably as good, if not better, than any other that could be selected, for the following reasons: The shoal on the sound side is narrower opposite this point, and the deeper water makes in closer to the beach. The beach at this point has about its minimum width and the amount of cutting would be the least.

The following is an estimate of the probable cost of the above-described improvement. Cut to be 100 feet wide and 3 feet deep at mean low water extending to the 3-foot contour on the sound side:

Dredging sand, 86,219 cubic yards, at 35 cents	$30,176
Contingencies, 20 per cent	6,035
Total	36,211

For cut 100 feet wide, 6 feet deep at low water, to 6-foot contour on sound side:

Dredging sand 138,199 cubic yards, at 35 cents	$48,369
Contingencies, 20 per cent	9,674
Total	58,043

For cut 100 feet wide, 10 feet deep at mean low water, to 10-foot contour on sound side:

Dredging sand, 200,866 cubic yards, at 35 cents	70,303
Contingencies, 20 per cent	14,060
Total	84,363

The above estimates of the amount of material to be removed are based on data obtained during my preliminary examination, and are believed to be approximately correct; the estimates of cost are based upon past work in this district.

The total cost of the preliminary examination upon which the above report is based was approximately $42.

Very respectfully, your obedient servant,

MASON M. PATRICK,
First Lieutenant of Engineers.

Capt. W. H. BIXBY.
Corps of Engineers, U. S. A.

L 28.

PRELIMINARY EXAMINATION OF HARBOR OF WASHINGTON, PAMLICO RIVER, NORTH CAROLINA.

[Printed in House Ex. Doc. No. 289, Fifty-first Congress, second session.]

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., December 27, 1890.

GENERAL: In accordance with the river and harbor act of the 19th September, 1890, and letter and orders from your office dated 20th September, and 4th October, 1890, I have the honor to submit herewith the following report upon a preliminary examination of the harbor of Washington, Pamlico River, North Carolina.

This examination was made by Lieut. M. M. Patrick, U. S. Engineers, under my orders. His full report is appended. My opinions, as below stated, are based partly on his report and partly upon my own personal knowledge of the neighborhood.

Washington, N. C., is a town of about 5,000 inhabitants at the mouth of the Tar River and at the head of the Pamlico River, North Carolina. Both rivers together have a length of 217 miles and a total drainage area of about 4,900 square miles. Both rivers have been under governmental improvement since 1876, and in this time their commerce has increased from $500,000 up to $4,800,000 per year, showing a development of over $60 annual commerce for each $1 once spent by the United States in their improvement, this being also accompanied by a reduction

(USACE Annual Report 1891:1429) used in 1891 results

(USACE Annual Report 1891:1430) used in 1891 results

REPORT OF LIEUTENANT MASON M. PATRICK, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., December 16, 1890.

CAPTAIN: I have the honor to submit the following report upon the preliminary examination of the harbor of Washington, N. C., with a view to its improvement by the General Government, made in compliance with your orders to me dated November 11, 1890.

Information as to this harbor was sought through newspapers and through circular letters sent to all parties supposed to be interested in the possible improvement. To these inquiries but few replies were received.

The information embodied in the following report was obtained mainly from the harbor commissioners of Washington, N. C.; from conversation with residents of Washington interested in the improvement of the harbor; from certain minor surveys made in the vicinity of Washington in connection with the work of improvement of the Pamlico and Tar rivers, and from my own personal inspection of the locality.

For map of the localities mentioned in the following report see Coast Survey Chart No. 144[1].

Washington, N. C., a town of about 5,000 inhabitants, is situated at the head of deep-water navigation of the Pamlico River, and since the Government undertook the improvement of this river it has rapidly increased in importance as a shipping and distributing point for goods and produce. New enterprises have been started, a considerable foreign trade has been built up, population and the value of real estate have increased, and it is stated that, if, after the improvement at Ocracoke Inlet (now in progress) is effected, vessels of greater draft can enter Washington Harbor, her commerce and general condition will be largely benefited.

The material prosperity of Washington has been almost entirely due to the Government improvement of the Pamlico and Tar rivers, and at present the town is almost entirely dependent upon water transportation. Fifteen steamers ascend the Pamlico River regularly to Washington, and four others make regular trips on the river above Washington. Besides these a large number of sailing vessels enter and leave the harbor.

Most of the steamers running to Washington pass through the Albemarle and Chesapeake Canal; the sailing vessels enter and leave Pamlico Sound by Hatteras or Ocracoke Inlets. The maximum draft that can be carried through the canal is about 8 feet, and the maximum draft that is generally carried through Ocracoke or Hatteras Inlets is about 9 feet.

The Pamlico River, practically an arm of Pamlico Sound, from its mouth 27 miles upward, has a broad, unobstructed channel, with a depth of at least 10 feet at mean low water. Thence, about 4 miles to Washington, the river gradually shoals and the channel becomes narrow and crooked.

On the 24th and 25th of November, 1890, when the water surface was about 0.3 foot above mean low-water level, a careful examination was made of this latter portion of the river—practically the entrance to the harbor of Washington—and a number of soundings were taken.

In past years two short channels have been dredged in the river, one immediately below, the other about 1 mile below the town. These channels were dredged to 9 feet below mean low water, and from the lower channel there were removed a number of large stumps. (See Annual Report of Chief of Engineers for 1880, pages 836 to 838, and for 1882, pages 1083 and 1084.)

My examination indicates some shoaling in these dredged channels, and it is reported that there are still some stumps in the lower channel that require removal. The shoaling amounts to about 1 foot to 1.5 feet and the material deposited seems to consist principally of soft mud and sand.

Consequently the available depth that can be carried into or out of this harbor is at present not more than 8 feet at mean low water, and considerable delay is frequently caused by the grounding of some of the larger classes of vessels that endeavor to use this harbor.

In addition to this lack of depth, the present channel is crooked and difficult to run.

The worst shoaling in the upper of the two dredged channels is near its upper end, where a shoal making off from the small island called the "Castles," opposite Washington, encroaches upon the channel.

After leaving the town of Washington, the channel at present followed by shipping is near the right bank of the river. Near the left bank of the river there is a false channel which ends about three-fourths of a mile below Washington, being separated from the harbor by the shoal at the mouth of Wind Mill and Runyon creeks. This channel was also examined and a number of soundings taken in it. My examination indicates that the depth in this false channel, up to near the above-men-

(USACE Annual Report 1891:1431) used in 1891 results

tioned shoal, will average about 1 foot more than the depth of the channel at present in use. The northern channel is broad, the bottom is mainly hard sand, and it is reported that there are few if any stumps to be met with.

The shoal at the mouth of the above-mentioned creeks appears to consist of hard, compact sand. There has apparently been but little change in it in a number of years, and it is probable that a channel cut through it would be fairly permanent.

The arguments advanced in favor of adopting this northern channel are that if an entrance to the harbor were provided by this route, cutting across the shoal at the mouth of these creeks, the water front of the town would be much improved; the new channel would be straighter; that piers and docks, which have to be extended some distance to reach the present deep-water channel, contract the harbor entrance and are obstructions to navigation by the smaller classes of vessels. Such piers would not have to extend so far to reach the deep water which would be provided by the proposed new channel.

In discussing the improvement of this harbor we must consider not only what is needed by the present commerce, but also what will be needed so soon as Ocracoke Inlet, now being improved by the Government, will permit vessels drawing from 10 to 14 feet to enter Pamlico Sound and ascend the Pamlico River.

(1) The present commerce: As stated above, Washington is largely dependent upon water transportation; the town is growing in importance as a shipping point; on account of the deterioration and crookedness of the present main ship channel considerable delay and difficulty are experienced by vessels entering and leaving the harbor. Since the two above-mentioned dredged channels were completed in 1877 no further improvement has been made in the harbor. At that date a minimum depth of 9 feet at mean low water was regarded as demanded by the then needs of commerce. My examination indicates that certainly no less depth than this, 9 feet at mean low water, will be sufficient to accommodate the present commerce, and also that it would be of great advantage to shipping now using the harbor if the channel were straightened.

(2) Future commerce: Ocracoke Inlet, one of the entrances from the ocean to Pamlico Sound, is at present under improvement by the Government, and it is believed that this improvement, when finished, will permit vessels drawing from 10 to 14 feet to enter and leave the sound. Such vessels can ascend the Pamlico River to within a short distance of Washington, but on account of the present lack of sufficient channel depth they can not enter the harbor.

There seems to be no doubt that the present commerce would be largely increased if such vessels could have access to this harbor, and consequently that just so soon as this improvement at Ocracoke is sufficiently advanced to permit the entrance to the sound of such vessels the needs of the commerce of Washington will demand a greater depth than 9 feet at mean low water.

I have deemed it best to make an estimate of the cost of improving both the present or southern channel and also the northern channel, so as to secure an available depth in either channel of (1) at least 9 feet at mean low water and (2) for a least depth of 10 feet at mean low water.

Present or southern channel: Channel to be straight, 150 feet wide, 9 feet deep at mean low water:

Dredging, approximately, 77,000 cubic yards, at 30 cents	$22,100
Removing stumps	5,000
Total	27,100
Contingencies, 20 per cent	5,420
Grand total	32,520

Northern channel, same dimensions as above:

Dredging 146,600 cubic yards, at 30 cents	$43,980
Removing stumps	1,500
Total	45,480
Contingencies, 20 per cent	9,096
Grand total	54,576

For improving present channel: Channel to be 150 feet wide and 10 feet deep at mean low water:

Dredging 275,000 cubic yards, at 30 cents	$82,500
Removing stumps, etc	10,000
Total	92,500
Contingencies, 20 per cent	18,500
Grand total	111,000

(USACE Annual Report 1891:1432) used in 1891 results

Improving northern channel to same dimensions, as provided in estimate immediately preceding:

Dredging 375,000 cubic yards, at 30 cents	$112,500
Removing stumps	2,500
Total	115,000
Contingencies, 20 per cent	23,000
Grand total	138,000

The above estimates of the amount of material to be removed are based on the data obtained during my preliminary examination and are believed to be approximately correct; the estimates of cost are based upon past work in this district.

The annual commerce of Washington, N. C., at present is estimated as follows:

Articles.	Exports.	Imports.	Total.
Cotton and products	$1,300,000		$1,300,000
Rice	10,000		10,000
Grain and forage		$100,000	100,000
Vegetables and truck	15,000		15,000
Fish and oysters	300,000		300,000
Naval stores	10,000		10,000
Lumber and products	450,000		450,000
General merchandise	100,000	2,500,000	2,600,000
Total	2,185,000	2,600,000	4,785,000

It is stated that if the additional depth is provided, and the entrance to the harbor of deeper draft vessels facilitated, an increase of from 10 to 25 per cent. may be expected in the above annual commerce.

Should this improvement be decided upon, a short preliminary survey would probably be necessary to accurately fix the limits of the needed dredging. Such a survey would probably cost not more than $300.

The total cost of the preliminary examination upon which the above report is based was approximately $42.

Very respectfully, your obedient servant,

MASON W. PATRICK,
First Lieutenant of Engineers.

Capt. W. H. BIXBY,
Corps of Engineers, U. S. A.

SUPPLEMENTARY REPORT.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., February 21, 1891.

GENERAL: In accordance with directions from your office dated 6th January, 1891, I have the honor to submit herewith a report on the survey of the harbor of Washington, Pamlico River, North Carolina, to accompany my report of 27th December, 1890, upon its preliminary examination. In that report this harbor was recommended as worthy of improvement to 9 feet depth of channel, and the statement was made that a survey of the harbor was then in progress in connection with the general improvement of the Pamlico and Tar rivers, of which this harbor forms a part. This survey has now been completed sufficiently to show the work necessary to obtain the above-recommended channel way.

The channel which will be the least expensive, natural, and at the same time most advantageous to general navigation will occupy a location coinciding very nearly with the existing route of navigation as marked upon the Coast Survey charts, and as partially improved in

(USACE Annual Report 1891:1433) used in 1891 results

past years. The existing Coast Survey charts show the general condition of the river and present channel with an exactness sufficient for the uses of this report, and so no special map is deemed necessary. All that appears necessary is to straighten and deepen the present route, especially at its worst places. The local circumstances, as brought out by the recent survey, cause me to recommend the same depth, 9 feet at ordinary low water, as in my report on the preliminary examination, but to now recommend a channel width of 200 feet.

The cost of this work is estimated as follows:

Length.	Width.	Average depth of cutting.	Total cutting.	Cost.
Feet.	*Feet.*	*Feet.*	*Cubic yards.*	
2,900	200	1.9	40,814	.....
2,400	200	1.5	26,667	.....
3,250	200	1.9	45,741	.....
Estimated at 33⅓ cents per cubic yard			113,222	$37,740
Superintendence and contingencies, about 20 per cent			.....	7,260
Total cost			.....	45,000

Very respectfully, your obedient servant,

W. H. BIXBY,
Captain, Corps of Engineers.

Brig. Gen. THOMAS L. CASEY,
Chief of Engineers, U. S. A.

L 29.

PRELIMINARY EXAMINATION OF WHITE OAK RIVER, FROM ROBERTS LANDING TO COLLINS CROSSING, NORTH CAROLINA.

[Printed in House Ex. Doc. No. 97, Fifty-first Congress, second session.]

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., November 25, 1890.

GENERAL: I have the honor to submit herewith the following report upon the examination of White Oak River, from Robert Landing to Collins Crossing, North Carolina, ordered by river and harbor act of September 19, 1890, and assigned to me by letters and orders from your office dated September 20 and October 4, 1890.

The White Oak River was examined by me in person under the provisions of the river and harbor act of August 11, 1888, and was then recommended as worthy of improvement for steamboats from its mouth upward 29 miles to near Sabistons Bridge, and thence for flat boats 21 miles further to Collins Ford (or Collins Crossing), at a total estimated cost of $45,000, to be (for advantageous work) voted at the rate of about $10,000 or more per year. Robert Landing (otherwise called Foscue Landing) is about 4 miles below Sabistons Bridge. No funds have as yet been voted for this work. The full report upon this examination is to be found printed in pages 1127 to 1129, Part II, Annual Report of the Chief of Engineers, United States Army, for 1889. Since this examination and report there have been no special changes or developments at the White Oak River to cause any special change in the above report and its recommendations.

(USACE Annual Report 1891:1434) used in 1891 results

COMMERCIAL STATISTICS.

The commerce for the year ending December 31, 1891, is estimated as follows:

Class of goods.	Exports.	Imports.	Total.	Tonnage.
Cotton and products	$1,000,000		$1,000,000	7,000
Tobacco	130,000		130,000	150
Rice	20,000		20,000	500
Grains and forage	3,000	$5,000	8,000	250
Vegetables and truck	130,000		130,000	4,500
Live stock and products	6,000	10,000	16,000	200
Fish, oysters, etc	150,000		150,000	8,000
Naval stores	15,000		15,000	1,000
Lumber and products	1,000,000		1,000,000	150,000
Coal and minerals		5,000	5,000	1,000
Fertilizers		100,000	100,000	2,000
Machinery		100,000	100,000	1,000
General merchandise	200,000	2,000,000	2,200,000	20,000
Total	2,654,000	2,220,000	4,874,000	195,600

The above statistics are based mainly upon reports of Assistant Engineer William H. Chadbourn, jr., made after much correspondence and conversation with steamboat captains and agents, custom-house officials, and prominent shippers and merchants.

Pamlico and Tar rivers, North Carolina.

APPROPRIATED.

Date.	Amount.	Aggregate.
July 4, 1836, to July 7, 1838	$10,000	$10,000
August 14, 1876	15,000	15,000
March 3, 1879	6,000	21,000
June 14, 1880	9,000	30,000
March 3, 1881	8,000	38,000
August 2, 1882	10,000	48,000
July 5, 1884	5,000	53,000
August 5, 1886	5,000	58,000
August 11, 1888	10,000	68,000
September 19, 1890	10,000	78,000

EXPENDED.

Fiscal year ending June 30—	During year.	Aggregate.
1837 to 1839	$10,000.00	$10,000.00
1877	363.96	363.96
1878	12,565.47	12,929.43
1879	1,209.80	14,139.23
1880	6,605.16	20,744.39
1881	8,392.24	29,136.63
1882	6,794.09	35,930.72
1883	3,932.75	39,863.47
1884	5,802.86	45,666.33
1885	4,870.77	50,537.10
1886	2,414.23	52,951.33
1887	3,161.28	56,112.61
1888	1,663.72	57,776.33
1889	6,832.20	64,608.53
1890	1,618.37	66,227.90
1891	2,565.23	68,793.13

(USACE Annual Report 1892:1122) used in 1891 results

Pamlico and Tar rivers, North Carolina—Continued.

FREIGHT TRANSPORTED.

Fiscal year ending June 30—	Tons.	Value.
1876	21,000	$500,000
1878	.....	2,190,000
1887	.....	2,336,703
1888	.....	2,888,744
1889	.....	4,642,990
1890	277,832	4,679,819
1891	.....	6,742,475

List of steamers navigating the Pamlico and Tar rivers, North Carolina, in the fiscal year ended June 30, 1892.

Names of steamers.	Net tonnage.	From—	To—	Number of trips yearly.
Pamlico	254	Washington	Norfolk	5
Annie	246	do	do	15
Vesper	202	do	do	28
Albemarle	37.60	do	do	64
Alpha	233	On lower Pamlico	Washington and Norfolk.	Irregular.
Beaufort	385	do	do	Do.
Greenville	68	Washington	Tarboro	3 trips per week part of year.
R. L. Myers	128	do	do	3 trips per week when height of water permits.
Delta	86	On river	On river	Irregular.
Beta	57	do	do	Do.
Edith*	19	do	do	Do.
E. T. Whittaker*	25	do	do	Do.
Geo. M. Hill*	26	do	do	Do.
J. W. Paxton*	27	do	do	Do.
Josie*	10	do	do	Do.
Lizzie Massey*	23	do	do	Do.

* Tugboats.

L 8.

IMPROVEMENT OF CONTENTNIA CREEK, NORTH CAROLINA.

It is the largest tributary to the Neuse River, into which it flows from the left bank 32 miles above Newbern.

At Stantonsburg, 63 miles by river (30 by land) from its mouth, the Contentnia becomes steeper in slope, narrows rapidly, "and is totally impassable even at mean low water;" thence to its mouth it is very tortuous, and when its improvement was commenced by the United States in 1881 it was "badly choked with fallen timber, sunken logs, and snags, also obstructed by sand bars and navigation rendered exceedingly difficult, in many places next to impossible, by the dense overhanging growth."

The project of 1881, continued without modification, is to clear it of overhanging trees and its channel of snags and logs to the depth of not less than 3 feet at the flush-water stages of eight or nine months' annual duration, at a cost estimated in 1888 at $77,500.

At the date of this report by the expenditure of upwards of $48,700, the channel to the depth of 3 feet had been moderately well cleared from the mouth 31 miles up to Snow Hill, and very roughly cleared the remaining 32 miles to Stantonsburg.

The traffic on the creek is by the steamer *Laura*, of 21 tons, making

(USACE Annual Report 1892:1123) used in 1891 results

The work of the past year has been the continuation of dredging; 84,021.92 cubic yards of material having been removed from 5,291 linear feet of cutting of variable widths and 9 feet deep at low water, through Royal Shoal, at head of Wallace Channel.

The commerce on this stream during 1895 amounted to 30,223 tons.

July 1, 1895, balance unexpended		$91,681.09
June 30, 1896, amount expended during fiscal year		27,827.84
		63,253.25
July 1, 1896, balance unexpended	$8,225.92	
July 1, 1896, outstanding liabilities	36,944.50	
July 1, 1896, amount covered by uncompleted contracts		45,170.42
July 1, 1896, balance available		18,082.83

(See Appendix K 1.)

2. *Fishing Creek, North Carolina.*—From its confluence with the Tar River, 94 miles above Pamlico Sound, for about 33 miles, up to Wilmington and Weldon Railroad Bridge, Fishing Creek is from 35 to 150 feet wide, with controlling channel depth on its bars of 3 feet at the average high-water stage of winter and spring. It is obstructed by many snags.

The project of 1889 as modified in 1896 is to clear out the natural obstructions up to the Wilmington and Weldon Railroad Bridge, at an estimated cost of $22,750, and to maintain the improvement.

No money had been expended on this improvement up to June 30, 1895.

The acts making appropriations provide that the money shall not become available until draws are provided in such bridges as are, in the opinion of the engineer in charge, unreasonable obstructions to navigation.

The commerce on this stream during 1895 amounted to about 1,700 tons, and consisted principally of timber in rafts, valued at $2 per ton, $3,400.

July 1, 1895, balance unexpended	$15,000.00
June 30, 1896, amount expended during fiscal year	37.03
July 1, 1896, balance unexpended	14,962.97

(See Appendix K 2.)

3. *Pamlico and Tar rivers, North Carolina.*—(One river, called the Pamlico below and the Tar above Washington.) When the United States began to improve it, in 1877, its channel was obstructed by piles, wrecks, and bars. Betwe n Washington and Tarboro the available depth exceeded 2 to 3 feet not more than eight months annually, and above Washington the entire river was more or less obstructed by snags, logs, and stumps in the channel and by trees overhanging from its banks.

The project is that adopted in 1875, to secure by dredging and removal of war obstructions a clear and safe channel 9 feet deep at low water up to Washington; extended in 1879 to clear a channel 60 feet wide, 3 feet deep at low water 22 miles farther to Greenville, and 20 inches deep at low water 26 miles farther to Tarboro; again extended in 1889 to clear the river to its natural dimensions 40 miles farther to Little Fall, 2 miles below Rocky Mount, by removal of war obstructions, snags, logs, stumps, and overhanging trees, at a total final cost estimated in 1891 at $137,200. The project was extended in 1894 to include maintenance between Washington and Tarboro.

To June 30, 1895, $88,423.76 had been expended upon this work.

(USACE Annual Report 1896:161) used in 1896 Results

At that date the project for the river above Washington had been completed. Below Washington a depth of 8 feet had been obtained. These depths were maintained from the mouth to Greenville. The maintenance of projected depth from Greenville to Tarboro was uncertain. Above Tarboro nothing had been done since 1892.

During the fiscal year ending June 30, 1896, the river has been thoroughly resnagged from Tarboro to Washington and 1,550 linear feet of channel, 200 feet wide, below Washington, has been cleared of logs, snags, and stumps to existing depth.

A minimum channel depth of 7.5 feet below Washington and the projected depths from Washington to Tarboro existed at an examination in June, 1896.

The projected width was also maintained from Washington to Greenville.

Since the improvement was begun the tonnage has increased from 21,000 tons in 1876, with estimated value of $500,000, to 183,226.75 tons in 1895, with estimated value of $3,756,133.

July 1, 1895, balance unexpended	$9,576.24
Amount appropriated by act of June 3, 1896	5,000.00
	14,576.24
June 30, 1896, amount expended during fiscal year	4,377.24
July 1, 1896, balance unexpended	10,199.00
July 1, 1896, outstanding liabilities	589.62
July 1, 1896, balance available	9,609.38

(See Appendix K 3.)

4. Contentnia Creek, North Carolina.—When the United States began to improve it, in 1881, it was badly choked with fallen timber, snags, logs, stumps, sand bars, and dense overhanging growth.

The project of 1881, amended in 1894 to include maintenance below Snow Hill, is, by clearing it of these obstructions, to obtain from its confluence with the Neuse to Stantonsburg, 63 miles, a depth of not less than 3 feet during the higher stages of about nine months' duration annually at a cost estimated in 1888 at $77,500.

To June 30, 1895, $61,098.16 had been expended upon this work.

June 30, 1895, 19 miles of channel below Snow Hill was in good shape, having just been resnagged. No work has been done on the 32 miles between Stantonsburg and Snow Hill since 1891. There were several shoals near the mouth, on one of which the minimum channel depth was 1.4 feet.

With the amount applied during the fiscal year ending June 30, 1896, the channel has been snagged from Snow Hill to mouth of creek, a cut in bank above Hookerton was repaired, and preparations made for dredging operations on the worst shoal.

Since the improvement was begun the tonnage has increased from nothing in 1881 to 53,018 tons in 1895, valued at $255,087.

July 1, 1895, balance unexpended	$7,901.84
June 30, 1896, amount expended during fiscal year	3,296.40
	4,605.44
July 1, 1896, balance unexpended	242.58
July 1, 1896, outstanding liabilities	4,362.86
July 1, 1896, balance available	

(See Appendix K 4.)

5. Trent River, North Carolina.—When the United States began to improve it, in 1879, there was a channel 6 feet deep comparatively free

(USACE Annual Report 1896:162) used in 1896 Results

K 3.

IMPROVEMENT OF PAMLICO AND TAR RIVERS, NORTH CAROLINA.

[One river, called the Pamlico below and the Tar above Washington.]

When the United States began to improve it, in 1877, its channel was obstructed in two places below Washington by piles, just below Sparta by scuttled lighters, 1 mile below Tarboro by the wreck of a steamer, and immediately below Washington by a bar with a depth of 5 feet at low water on its crest in the channel. Between Washington and Tarboro the available depth exceeded 2 to 3 feet not more than eight months annually, and above Washington the entire river was more or less obstructed by snags, logs, and stumps in the channel and by trees overhanging from its banks.

The project is that adopted in 1875 to secure by dredging and removal of war obstructions a clear and safe channel, 9 feet deep at low water, up to Washington, extended in 1879 to clear a channel 60 feet wide, 3 feet deep at low water, 22 miles farther to Greenville, and 20 inches deep at low water, 26 miles farther to Tarboro; again extended in 1889 to clear the river to its natural dimensions 40 miles farther to Little Fall, 2 miles below Rocky Mount, by removal of war obstructions, snags, logs, stumps, and overhanging trees, at a total final cost estimated in 1891 at $137,200.

The project was extended in 1894 to include maintenance between Washington and Tarboro.

To June 30, 1895, $88,423.76 had been expended upon this work.

At that date the project for the river above Washington had been completed. Below Washington a depth of 8 feet had been obtained.

Below Washington the only obstructions at prevailing stages to vessels that could reach the river were a large number of stumps on a long shoal, which were frequently struck with the keel or propeller. In 1892 and 1893 the channel for a distance of 6,700 feet was well cleared of these stumps to a depth of 9 feet, embracing all the worst ones in the river. The channel on the shoal for a further distance of about 1,200 feet contains many stumps which have to be removed, besides very thin dredging for about 4 miles, mostly of very soft bottom, to obtain an unobstructed depth of 9 feet. These depths were maintained from the mouth to Greenville. The maintenance of project depth from Greenville to Tarboro was uncertain. Above Tarboro nothing had been done since 1892. On account of the high stage of water prevailing in the fiscal year ending June 30, 1895, whatever snags there were in the channel had not obstructed navigation.

During the fiscal year ending June 30, 1896, the river has been thoroughly resnagged from Tarboro to Washington, 300 logs, 1,071 snags, 367 trees, and 303 stumps having been removed from the channel and from the banks; 323 trees, 6 trees trimmed, 26 logs, 85 snags, 22 stumps, and 10 trees rolled back. Fifteen hundred and fifty linear feet of channel, 200 feet wide, below Washington have been recleared of stumps to existing depth, 79 stumps, 6 logs, and 6 snags having been removed.

Minor repairs were made to the jetty at Red Banks at a cost of $16.64.

A minimum channel depth of 7.5 feet below Washington, of 3 feet to Greenville, and of 2.1 feet to Tarboro existed at an examination June, 1896; +1 foot on the Tarboro gauge, +0.5 foot on the Greenville gauge, and +3 feet on the Washington gauge being assumed as ordinary low water.

(USACE Annual Report 1896:1101) used in 1896 Results

The project width also existed between Washington and Greenville.

All work has been performed by hired labor and use of United States plant.

The amount expended for maintenance was $4,300; for new work, $617.39.

Draws 30 feet wide have been placed in county bridges at Tarboro and Bell's Bridge. Both lines running regularly to Tarboro have built new and larger boats during the past year.

The river is in the collection district of Pamlico, N. C.

The sum of $3,000 will be required annually for maintenance of this improvement.

Money statement.

July 1, 1895, balance unexpended	$9,576.24
Amount appropriated by act of June 3, 1896	5,000.00
	14,576.24
June 30, 1896, amount expended during fiscal year	4,377.24
July 1, 1896, balance unexpended	10,199.00
July 1, 1896, outstanding liabilities	589.62
July 1, 1896, balance available	9,609.38
Amount (estimated) required for completion of existing project	38,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1898 Submitted in compliance with requirements of sections 2 of river and harbor acts of 1866 and 1867 and of sundry civil act of March 3, 1893.	*41,500.00

REPORT OF W. H. CHADBOURN, JR., ASSISTANT ENGINEER.

UNITED STATES ENGINEER OFFICE,
Newbern, N. C., June 30, 1896.

COLONEL: The hoister *Pamlico* commenced work on October 18, 1895. * * *

Maintenance operations above Washington ceased June 8, 1896, when work commenced below Washington, and still continues. * * *

Considerable complaint is made by steamers navigating the river between Greenville and Washington, but the cause is that the vessels draw considerably more water than the project depth (5 feet). * * *

It is doubtful if more than the present project, 20 inches, is practicable above Greenville.

Very respectfully, your obedient servant,

WM. H. CHADBOURN, Jr.,
Assistant Engineer.

Lieut. Col. D. P. HEAP,
Corps of Engineers, U. S. A.
(Through First Lieut. Edgar Jadwin.)

COMMERCIAL STATISTICS.

Class of goods.	Tons.	Class of goods.	Tons.
Cotton	2,711	Oysters	157½
Cotton seed	2,770	Rosin	230
Cotton-seed meal	497½	Turpentine:	
Tobacco, leaf	10½	Crude	230
Rice	1,650	Spirits	46½
Grains	4,211	Wood	6,420
Hay	1,900	Timber	51,506
Potatoes	4,433	Lumber	49,698
Vegetables	378	Shingles	2,638½
Cattle	10	Fertilizers	30,060
Horses	6	Coal and minerals	10,999
Hogs	3½	General merchandise	12,291
Poultry	15½		
Eggs	52	Total	183,226½
Fish	212½		

Number of passengers, 9,248.

* Three thousand dollars included for maintenance.

(USACE Annual Report 1896:1102) used in 1896 Results

Gain since last year, 11,651¾ tons, excluding timber, this item not having been reported last year. Transportation lines established during the year, none.

Freight transported.

Calendar year ending December 31—	Tons.	Calendar year ending December 31—	Tons.
1875	21,000	1892	107,097
1890	277,832	1893	119,505
1891	195,600	1894	119,979

Pamlico and Tar rivers, North Carolina.

APPROPRIATED.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
July 4, 1836, to July 7, 1838	$10,000	$10,000	July 5, 1884	$5,000	$53,000
			August 5, 1886	5,000	58,000
August 14, 1876	15,000	15,000	August 11, 1888	10,000	68,000
May 3, 1879	6,000	21,000	September 19, 1890	10,000	78,000
June 14, 1880	9,000	30,000	July 13, 1892	10,000	88,000
March 3, 1881	8,000	38,000	August 17, 1894	10,000	98,000
August 2, 1882	10,000	48,000	June 3, 1896	5,000	103,000

EXPENDED.

To June 30—	Amount.	To June 30—	Amount.
1837 to 1839	$10,000.00	1886	$52,951.33
1877	363.96	1887	56,112.61
1878	12,929.43	1888	57,776.33
1879	14,139.23	1889	64,608.53
1880	20,744.39	1890	66,227.90
1881	29,136.63	1891	68,793.13
1882	35,930.72	1892	75,724.85
1883	39,863.47	1893	84,926.56
1884	45,666.33	1894	87,474.83
1885	50,537.10	1895	88,423.76

Statement of vessels navigating Pamlico and Tar rivers, North Carolina, during the calendar year ending December 31, 1895.

Class of vessels.	Number.	Aggregate net tonnage.	Draft.
			Feet.
Steamers and steam tugs	35	2,955.86	3 to 8
Barges	60	9,680.69	4 to 8
Schooners	74	3,846.26	3 to 8
Sloop	1	8.11	3.5

K 4.

IMPROVEMENT OF CONTENTNIA CREEK, NORTH CAROLINA.

When the United States began to improve it, in 1881, it was badly choked with fallen timber, snags, logs, and stumps; also obstructed by sand bars, and navigation rendered exceedingly difficult, in many places next to impossible, by the dense overhanging growth.

The project of 1881, amended in 1894 to include maintenance below Snow Hill, is, by clearing it of these obstructions, to obtain, from its confluence with the Neuse, 63 miles, to Stantonsburg, a depth of not less than 3 feet during the higher stages of about nine months duration annually, at a cost, estimated in 1888, of $77,500.

(USACE Annual Report 1896:1103) used in 1896 Results

3. Pamlico and Tar rivers, North Carolina.—(One river, called the Pamlico below and the Tar above Washington.) Distances: From Washington to Greenville, 22 miles; Tarboro, 49 miles; Fishing Creek, 56 miles; Little Falls, 88 miles; Rocky Mount, 89 miles.

When improvement by the United States began, in 1877, the river was obstructed by war blockades, rocks, and fallen timbers, the governing low-water depth being 5 feet to Washington and probably less than 1 foot to Tarboro.

The project of 1875 was to obtain a 9-foot channel to Washington; extended in 1879 to clear a 60-foot channel 3 feet deep to Greenville and 20 inches deep to Tarboro; extended in 1889 to clear natural channel to Little Falls; cost estimated in 1891 at $137,200.

To June 30, 1900, $115,348.77 had been expended, of which $13,364.08 was for maintenance.

During the past year the river had been kept clear and the project depth of 3 feet extended to Greenville, a gain of 1 foot in depth since the preceeding year. The governing low-water depths are 8 feet to Washington, 3 feet to Greenville, and about 15 inches to Tarboro. Work was suspended in March on account of lack of funds, the small remaining balance being reserved for care of plant stored at depot.

During the calendar year 1900 the commerce of the stream amounted to 613,895 tons, an increase of 106,414 tons since the preceding year. No transportation lines were established during the year.

For lack of funds the jetties above Greenville have decayed and the channel deteriorated. Estimated cost of restoring channel, $20,000.

July 1, 1900, balance unexpended	$2,651.23
June 30, 1901, amount expended during fiscal year	2,520.44
July 1, 1901, balance unexpended	130.79
Amount (estimated) required for completion of existing project	29,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1903, for works of improvement and for maintenance, in addition to the balance unexpended July 1, 1901	20,000.00
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	

(See Appendix L 3.)

4. Contentnia Creek, North Carolina.—Distances: From mouth to Snowhill, 31½ miles; Speight's bridge, 50½ miles; Stantonsburg, 63 miles.

When improvement by the United States began, in 1881, the stream was choked with fallen timber, sand bars, and overhanging growth.

The project of 1881 was to clear out obstructions and obtain a depth of 3 feet to Stantonsburg during nine months annually, at a cost, estimated in 1888, of $77,500; amended in 1894 to include maintenance below Snowhill; amended in 1899 to include maintenance to Stantonsburg.

To June 30, 1900, $70,087.78 had been expended, of which $5,693.22 was for maintenance.

During the past year work has been restricted to keeping the channel clear to Snowhill, to which point the project depth exists. Work was suspended in March on account of lack of funds, the small remaining balance being reserved for care of plant stored at depot.

The commerce for the calendar year 1900 was 13,885 tons, a gain of 7,291 tons over the preceding year. No transportation lines were established during the year.

(USACE Annual Report 1901:301) used in 1901 Results

L 3.

IMPROVEMENT OF PAMLICO AND TAR RIVERS, NORTH CAROLINA.

[One river, called the Pamlico below and the Tar above Washington.]

For previous history, see annual report for 1900, pages 267 and 1798.

Work during the year has consisted in dredging, of pursuance of project, to obtain 9 feet depth to Washington and 3 feet depth to Greenville, and of snagging to maintain cleared channel between Washington and Tarboro.

The dredging consisted of the removal of 1,710 cubic yards from the cut below Washington and 1,313 cubic yards from three shoals between the nineteenth milepost and Greenville. Dredging was then suspended because of lack of funds.

As a result of the dredging just below Greenville, the project depth of 3 feet has been obtained to that point, an increase of 1 foot during the year. This portion of the river is reported by boatmen to be in better condition than ever before.

Snagging for maintenance has been carried on between Washington and Tarboro by the removal from the channel of 58 snags, 13 stumps, 26 logs, and 27 trees, and from the banks 52 overhanging trees, at a cost of $819.66.

Above Greenville the project depth of 20 inches does not exist, the jetties having deteriorated for lack of maintenance. The governing low-water depth above Greenville is about 15 inches and this part of the river is navigable only during the high stages.

The small available balance will be used up in caring for plant stored at depot. Additional appropriations should be applied to completion of dredging just below Washington to obtain project depth of 9 feet, and also to the maintenance of the present channel between Washington and the mouth of Fishing Creek, at the rate of $6,000 annually.

The commercial statistics show a tonnage for 1900 of 613,895, an increase over 1899 of 106,414 tons.

This improvement has been in local charge of Assistant Engineer S. F. Burbank.

This river is in the collection district of Pamlico, N. C.

Money statement.

July 1, 1900, balance unexpended		$2,351.23
June 30, 1901, amount expended during fiscal year		2,520.44
July 1, 1901, balance unexpended		130.79
Amount (estimated) required for completion of existing project		29,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1903, in addition to the balance unexpended July 1, 1901:		
For works of improvement	$29,500.00	
For maintenance of improvement	6,000.00	
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		35,500.00

(USACE Annual Report 1901:1487) used in 1901 Results

and in compliance with the terms of said resolution to report that the work of removing the obstructions at the mouth of Brunswick River, North Carolina, will, it is estimated by the local engineer officer, Capt. E. W. Van C. Lucas, Corps of Engineers, cost $1,000.

Very respectfully, your obedient servant,

JOHN M. WILSON,
Brig. Gen. Chief of Engineers,
U. S. Army.

Hon. ELIHU ROOT,
Secretary of War.

L 22.

ESTABLISHMENT OF HARBOR LINES IN PAMLICO RIVER AT WASHINGTON, NORTH CAROLINA.

WASHINGTON, N. C., *July 17, 1900.*

SIR: We, the undersigned citizens of Washington, N. C., respectfully petition that the harbor line for the port of Washington, N. C., on Pamlico River, be established.

WALLING LUMBER COMPANY,
W. B. WALLING, *President,*
And others.

The Honorable SECRETARY OF WAR.

* * * * * * *

[Second indorsement.]

U. S. ENGINEER OFFICE,
Wilmington, N. C., August 1, 1900.

Respectfully forwarded to the Chief of Engineers, recommended for approval.

E. W. VAN C. LUCAS,
Captain, Corps of Engineers.

[Third indorsement.]

OFFICE CHIEF OF ENGINEERS,
U. S. ARMY,
August 4, 1900.

Respectfully returned to Captain Lucas, attention being invited to the provisions of section 11 of the river and harbor act of March 3, 1899.

If, in Captain Lucas's opinion, the establishment of harbor lines at Washington, N. C., is necessary for the preservation and protection of the harbor, he will submit a tracing showing the lines he may recommend for adoption.

By command of Brig. Gen. Wilson:

A. MACKENZIE,
Lieut. Col., Corps of Engineers.

[Fourth indorsement.]

U. S. ENGINEER OFFICE,
Wilmington, N. C., September 14, 1900.

Respectfully returned to the Chief of Engineers.

The establishment of harbor lines at Washington, N. C., is not absolutely necessary for the preservation of its harbor, because no structure can be built there without the authority of the Secretary of War, required by section 10, river and harbor act of March 3, 1899.

But the establishment of harbor lines would save considerable future work at the district office, the Chief of Engineers' office, and the Sec-

(USACE Annual Report 1901:1570) used in 1901 Results

retary of War's office, by obviating the necessity of forwarding a separate application for the Secretary's approval in each particular case. It would also save to the applicants considerable loss of time incident to forwarding to Washington for such approval, which is, I understand, the principal reason why the within petition, signed by the leading shippers of the place, was submitted.

For reasons above described, the recommendation for approval in the second indorsement was made, and, if they be deemed sufficient, the accompanying tracing[1] shows the harbor lines which are recommended for adoption. In the event of its approval, it is recommended that the three projecting piers at A, B, and C be permitted to remain as at present, but that no future repair or renewal of same outside of the harbor line be permitted.

E. W. VAN C. LUCAS,
Captain, Corps of Engineers.

[Fifth indorsement.]

OFFICE CHIEF OF ENGINEERS,
U. S. ARMY,
September 19, 1900.

Respectfully returned to Captain Lucas.

This office is in doubt as to the scope of Captain Lucas's recommendation, whether it is intended to recommend the adoption of both the lines indicated on the map as having been suggested by Capt. W. H. Bixby or only one of them.

It is suggested that the line or lines recommended be drawn solid, that present legends be erased, and that they be marked "Proposed pierhead line," or "Proposed pierhead and bulkhead line," etc., as the case may be.

By command of Brig. Gen. Wilson:

CHAS. S. BROMWELL,
First Lieutenant, Corps of Engineers.

[Sixth indorsement.]

U. S. ENGINEER OFFICE,
Wilmington, N. C., October 3, 1900.

Respectfully returned to the Chief of Engineers.

The intention of the fourth indorsement was to recommend both of the old lines suggested by Capt. W. H. Bixby, the inner one as the limit for solid structures, and the outer one as the limit for open-work structures.

The suggestion in fifth indorsement has been complied with and tracing returned herewith under separate cover.

"Pierhead line" is understood to mean a limiting line for open structures, and "Bulkhead line" a limiting line for solid structures.

E. W. VAN C. LUCAS,
Captain, Corps of Engineers.

[Seventh indorsement.]

OFFICE CHIEF OF ENGINEERS,
U. S. ARMY,
October 9, 1900.

Respectfully forwarded to the Secretary of War.

Application is made by citizens of Washington, N. C., for establishment of harbor lines in Pamlico River at that place.

[1] Not printed.

(USACE Annual Report 1901:1571) used in 1901 Results

The matter has been considered by Capt. E. W. Van C. Lucas, Corps of Engineers, the local officer, and his reports on the subject will be seen by reference to fourth and sixth indorsements hereon.

I recommend that the lines suggested by him and shown on the accompanying tracing be approved, and that the Secretary place his approval on the map which has been prepared for his signature.

JOHN M. WILSON,
Brig. Gen., Chief of Engineers,
U. S. Army.

NOTE.—The lines referred to above and shown on map mentioned were approved by the Secretary of War October 11, 1900, the approval being indicated on the map.

L 23.

ESTABLISHMENT OF HARBOR LINES IN CAPE FEAR RIVER AT SOUTHPORT, NORTH CAROLINA.

SOUTHPORT, N. C., *May 24, 1900.*

SIR: The authorities of the city of Southport respectfully ask that you establis dock line opposite and above the city of Southport, at a depth of a out 20 feet at mean low water.

Very respectfully,

JAS. A. WILLIAMS, *Mayor.*
M. C. GUTHRIE, *Clerk.*

Maj. VAN C. LUCAS,
U. S. Engineer Office, Wilmington, N. C.

* * * * * * *

[Sixth indorsement.]

OFFICE CHIEF OF ENGINEERS,
U. S. ARMY,
December 26, 1900.

Respectfully submitted to the Secretary of War.

The authorities of the town of Southport, N. C., having requested the establishment of harbor lines in the Cape Fear River opposite and above said town, the subject has been under consideration by Captain Lucas, the district officer, who submits the accompanying tracing,[1] on which are delineated pierhead and bulkhead lines, which he states are satisfactory to all interests.

I recommend that the lines be approved, and that the Secretary place his approval on the tracing which has been prepared for his signature.

JOHN M. WILSON,
Brig. Gen., Chief of Engineers,
U. S. Army.

NOTE.—The lines referred to above and shown on the map mentioned were approved by the Secretary of War under date of September 28, 1900, the approval being indicated on the map.

[1] Not printed.

(USACE Annual Report 1901:1572) used in 1901 Results

APPROPRIATED.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
July 4, 1836, to July 7, 1838	$10,000	$10,000	August 5, 1866	$5,000	$58,000
August 14, 1876	15,000	15,000	August 11, 1888	10,000	68,000
May 3, 1879	6,000	21,000	September 19, 1890	10,000	78,000
June 14, 1880	9,000	30,000	July 13, 1892	10,000	88,000
March 3, 1881	8,000	38,000	August 18, 1894	10,000	98,000
August 2, 1882	10,000	48,000	June 3, 1896	5,000	103,000
July 5, 1884	5,000	53,000	March 3, 1899	15,000	118,000
			June 13, 1902	35,500	153,500

COMMERCIAL STATISTICS FOR YEAR ENDING DECEMBER 31, 1901.

Class of goods.	Tons.	Class of goods.	Tons.
Cotton	10,328	Shingles	425.2
Cotton seed	9,375	Fertilizers	11,870
Cotton-seed oil	1,054	Machinery	244
Cotton-seed meal	2,695	General merchandise	76,108
Tobacco, leaf	21	Coal and minerals	3,904
Grains	10,642.2	Tar	20.6
Hay	3,157.5	Peanuts	201
Potatoes	20,528.2	Cotton-seed hulls	400
Vegetables	1,072	Rafting gear	42.5
Cattle	165.3	Railroad iron	922
Horses	189	Lime	4,000
Hogs	44.5	Shells	5,000
Poultry	54.2	Empty barrels	3,976
Eggs	398.2	Cabbage crates	558
Fish	72.5	Pea baskets	2
Oysters	16,282	Gum timber	1,000
Clams	150	Truck	3,000
Rosin	5	Hides	14.5
Wood	8,169	Junk	40
Timber	478,707.7		
Rice, rough	156.4	Total	935,311.5
Lumber	259,425		

Increase over last year, 321,416.5 tons.

Number of passengers, 13,293.

Transportation lines established during the year, 1 steamboat line.

Three hundred and three thousand eight hundred and eleven tons of the above total was exported.

Statement of vessels navigating Pamlico and Tar rivers, North Carolina, during calendar year ending December 31, 1901.

Class of vessel.	Number.	Aggregate net tonnage.	Draft.
			Feet.
Steamers	44	2,869	2.5 to 9
Sloops and schooners	42	1,097	2 to 8
Barges	40	11,000	5 to 9

In addition to the above there are numerous small sailing craft whose tonnage and number have not been taken into consideration.

M 4.

IMPROVEMENT OF CONTENTNIA CREEK, NORTH CAROLINA.

No work of improvement was done during the year for lack of funds, the expenditures having been for maintenance and care of plant.

The available balance is too small to warrant any work, although the stream is reported as in need of clearing.

* * * * * * *

(USACE Annual Report 1902:1132) used in 1901 results

timber, fertilizers, and peanuts. Additional work proposed is the maintenance of the natural channel as far as Beach Swamp.

References: Annual Reports for 1890, page 1179; 1893, page 1377; 1900, page 1796.

July 1, 1903, balance unexpended	$546.28
Amount of deposit of December 5, 1899, by Capt. W. E. Craighill, taken up during fiscal year	.40
	546.68
June 30, 1904, amount expended during fiscal year for maintenance of improvement	46.54
July 1, 1904, balance unexpended	500.14
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904. Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.	500.00

(See Appendix M 3.)

4. *Pamlico and Tar rivers, North Carolina.*—(One river called Pamlico below, and Tar above Washington, N. C.) Distance from Washington to Greenville, 22 miles; to Tarboro, 49 miles; Fishing Creek, 56 miles; Little Falls, 88 miles; Rocky Mount, 89 miles.

When improvement began the river was badly obstructed by war blockades, snags, logs, and fallen timber. The governing low-water depths were 5 feet to Washington and perhaps 1 foot to Tarboro, navigation to which place was practicable during freshet stages only.

The original project of 1875, as extended in 1879 and 1889, constitutes the existing project, and includes obtaining 9 feet depth to Washington, 60 feet width with 3 feet depth to Greenville, and 20 inches depth to Tarboro, and a clear natural channel to Little Falls, at a cost estimated in 1891 at $137,200.

Amount expended on previous project prior to 1876	$10,000.00
Amount expended on present project:	
For improvement	125,589.14
For maintenance	18,901.46
	144,490.60

The disbursements of the year, $21,628.51, were as follows: $598.31 outstanding indebtedness of last year; $9,155.68 applied to construction of new plant; $10,157.65 for dredging, and $1,716.87 for snagging.

A new dredge, the *Scuppernong*, and one new scow were completed during the year for work on this and other streams in the upper portion of the district.

The channel has been partially deepened to 9 feet below Washington, and the project depth has been obtained to Greenville. The governing depths are 8 feet to Washington, 2½ feet to Greenville, 9 inches at low water to Tarboro, thence 6 inches at low water to Little Falls. Dunbar's bridge (about 24 miles above Tarboro) is the head of navigation, to which point the project depth can be carried during freshet stages only, during which the water sometimes rises to 15 feet or higher at Tarboro.

Below Washington the only surface variations of importance are due to the wind; with an extreme range of about 3 feet under normal con-

(USACE Annual Report 1904:231) used in 1904 Results

ditions. Long protracted easterly or westerly winds sometimes cause a variation of 7 or 8 feet.

The commerce of 1903 amounted to 845,377 tons, a gain of 13,361.5 tons over the previous year, and consisted principally of lumber, timber, fertilizers, cotton, and other farm products.

One transportation line was established during the year.

It is proposed with the funds now available to complete the project below Washington and to maintain the natural channel above that point.

References: History and maps, Annual Reports, 1890, page 1114; 1891, page 1347; 1896, pages 161 and 1101.

Examinations and surveys: Annual Reports, 1873, page 555; 1879, page 700; 1891, page 1429; 1895, page 1365; 1897, page 1425.

July 1, 1903, balance unexpended		$30,687.46
June 30, 1904, amount expended during fiscal year:		
For works of improvement	$19,911.64	
For maintenance of improvement	1,716.87	
		21,628.51
July 1, 1904, balance unexpended		9,058.95
July 1, 1904, outstanding liabilities		1,653.84
July 1, 1904, balance available		7,405.11
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement, in addition to the balance unexpended July 1, 1904		3,000.00

Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.

(See Appendix M 4.)

5. *Contentnia Creek, North Carolina.*—Distance from the mouth to Snowhill, 31½ miles; Speight's bridge, 50½ miles; Stantonsburg, 63 miles.

In its original condition the stream was badly obstructed with fallen timber, sand bars, and overhanging growth.

The original project of 1881 was to clear the stream of these obstructions, so as to obtain from its mouth to Stantonsburg, 63 miles, a depth of not less than 3 feet during the higher stages, about nine months of the year, at a cost estimated in 1888 at $77,500. In 1894 the project was extended to include maintenance below Snowhill, and in 1899 it was extended to include maintenance from Stantonsburg to the mouth. The original project, as above extended, constitutes the existing project.

Amount expended up to June 30, 1904, for improvement	$64,394.56
Amount expended up to June 30, 1904, for maintenance	7,003.21
Total	71,397.77

On account of depleted funds the expenditures of the year have been very small, and confined entirely to maintenance by snagging below Snowhill. Only the worst obstructions were removed.

As a result of the expenditures the improvement has been maintained, as far as funds would permit, but the available funds in recent years have been too small to prevent deterioration. There is now a partially cleared channel from the mouth, 31½ miles, to Snowhill. During high water, which is variable in height, duration, and distribution, its total duration being from four to nine months per year, a depth

(USACE Annual Report 1904:232) used in 1904 Results

M 4.

IMPROVEMENT OF PAMLICO AND TAR RIVER, NORTH CAROLINA.

[One river called Pamlico below and Tar above Washington, N. C.]

References.—See page 231 of current summary.

The project for work below Washington is about 44 per cent completed; that for work above Washington (to Little Falls, near Rockymount) has been completed, but has deteriorated for lack of maintenance.

The disbursements for the year were $21,628.51, of which $598.33 was for outstanding liabilities of last year, leaving $21,030.18 pertaining to the present fiscal year. If to this the present outstanding liabilities, $1,653.84, be added, we obtain $22,684.04 as the cost of the work performed during the year.

This sum is made up as follows:

For construction of new plant	$9,155.68
For snagging by U. S. hoister *Trent*	1,876.92
For dredging by U. S. dredge *Albemarle*	5,846.40
For dredging by U. S. dredge *Scuppernong*	5,805.04

The *Trent* removed from the channel below Washington 1 large snag, 47 stumps, and 7 logs, and from the channel above Washington 5 logs, 14 large snags, 25 stumps, and 7 trees, and cut and hauled back from the bank 7 trees, and trimmed 3 trees.

The *Albemarle* removed 21,133 cubic yards of material and 17 logs, at a cost of 27½ cents, minus, for excavation, and $1.35 each for logs.

The *Scuppernong* removed 40,915 cubic yards of material, 63 logs, and 411 stumps, at a cost of 11½ cents, minus, per cubic yard for excavation, $1.35 each for logs, and $2.86 each for stumps.

The relative cost of dredging, removing logs, and removing stumps can not be obtained absolutely, but the above are the approximate costs of each.

The work of the two dredges was from a cut 66⅔ feet wide, 362 feet long immediately below wagon bridge at Washington, and from cuts below Washington, 75 feet wide and 300 feet long, 100 feet wide and 3,600 feet long, and 66⅔ feet wide and 2,600 feet long.

All dredging was to a depth of 9 feet mean low water.

The proposed application of the available balance is to complete the channel below Washington to the project depth and to maintain the natural channel above Washington.

Additional appropriations of $6,000 annually are recommended for the purpose of maintenance.

Money statement.

July 1, 1903, balance unexpended		$30,687.46
June 30, 1904, amount expended during fiscal year:		
For works of improvement	9,911.64	
For maintenance of improvement	1,716.87	
		21,628.51
July 1, 1904, balance unexpended		9,058.95
July 1, 1904, outstanding liabilities		1,653.84
July 1, 1904, balance available		7,405.11
Amount that can be profitably expended in fiscal year ending June 30, 1906, for maintenance of improvement in addition to the balance unexpended July 1, 1904		
Submitted in compliance with requirements of sundry civil act of June 4, 1897, and of section 7 of the river and harbor act of 1899.		6,000.00

(USACE Annual Report 1904:1479) used in 1904 Results

APPROPRIATIONS.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
July 4, 1836, to July 7, 1838	$10,000.00	$10,000.00	August 11, 1888	$10,000.00	$68,000.00
August 14, 1876	15,000.00	15,000.00	September 19, 1890	10,000.00	78,000.00
May 3, 1879	6,000.00	21,000.00	July 13, 1892	10,000.00	88,000.00
June 14, 1880	9,000.00	30,000.00	August 18, 1894	10,000.00	98,000.00
March 3, 1881	8,000.00	38,000.00	June 3, 1896	5,000.00	103,000.00
August 2, 1882	10,000.00	48,000.00	March 3, 1899	15,000.00	118,000.00
July 5, 1884	5,000.00	53,000.00	June 13, 1902	35,500.00	153,500.00
August 5, 1886	5,000.00	58,000.00	March 3, 1905	8,000.00	161,500.00
			Sales	172.65	161,672.65

COMMERCIAL STATISTICS FOR THE YEAR ENDING DECEMBER 31, 1904.

Class of goods.	Tons.	Class of goods.	Tons.
Cotton	6,329	Clams	5
Cotton seed	14,438	Wood	22,880
Cotton-seed oil	1,698	Timber	232,350
Cotton-seed meal	4,016	Lumber	146,148
Cotton-seed hulls	1,029	Shingles	303
Tobacco, leaf	29	Fertilizers	19,175
Rice, rough	124	Machinery	573
Grains	12,569	General merchandise	29,406
Hay	2,714	Coal and minerals	5,857
Potatoes	9,852	Tar	14
Vegetables	152	Peanuts	35
Cattle	108	Rafting gear	350
Horses	85	Lime	1,500
Hogs	25	Shells	1,875
Poultry	49	Brick	384
Eggs	121		
Fish	633	Total	514,401
Oysters	145		

Decrease since last year, 330,976 tons. Transportation lines established during the year, none. Number of passengers, 15,000.

Statement of vessels navigating Pamlico and Tar river, North Carolina, during the calendar year ending December 31, 1904.

Class of vessel.	Number.	Aggregate net tonnage.	Draft.
			Feet.
Steamers	31	1,595	2 to 8
Schooners	79	2,650	2 to 8
Barges	51	16,241	2 to 8
Naphtha launches	12	120	2 to 5

M 4.

IMPROVEMENT OF CONTENTNIA CREEK, NORTH CAROLINA.

Reference.—See page 239 of current summary.

The work of improvement is completed.

The work of the past year has been exclusively that of maintenance of the portion of the stream between its mouth and Snowhill by the removal of only those obstructions the removal of which was absolutely necessary to prevent the suspension of navigation. Four large snags, 1 stump, 3 logs, and 15 trees were removed from the channel,

(USACE Annual Report 1905:1205) used in 1904 results

The commerce for 1910 amounted to 2,519 short tons, valued at $177,357. It consisted principally of farm products and lumber.

The effect of the improvement on freight rates is unknown, but it renders navigation safer between Swan Quarter and points on Pamlico River.

The available balance will be applied to maintenance.

References: See House Document No. 445, Sixtieth Congress, first session.

July 1, 1910, balance unexpended	$14,575.00
June 30, 1911, amount expended during fiscal year, for works of improvement	7,758.83
July 1, 1911, balance unexpended	6,816.17
July 1, 1911, outstanding liabilities	677.15
July 1, 1911, balance available	6,139.02

(See Appendix M 4.)

5. Pamlico and Tar Rivers, N. C.—Tributary of Pamlico Sound. (One river, called the Pamlico below Washington, N. C., and the Tar above that point.) Distance from Washington to Greenville, 22 miles; to Tarboro, 49 miles; to Fishing Creek, 56 miles; to Little Falls, 88 miles; to Rocky Mount, 89 miles.

Prior to its improvement, which was begun in 1876, the Pamlico River (that portion of the stream below Washington) was obstructed by war blockades, sunken logs, snags, stumps, and sand shoals.

The governing low-water depths were 5 feet to Washington and perhaps 1 foot to Tarboro, the navigation to which place was practicable during freshet stages only. About 3 feet could be carried to Tarboro during about eight high-water months per year.

The original project for the improvement of the river below Washington was that submitted in December, 1875 (Annual Report of the Chief of Engineers for 1876, p. 361), and adopted by Congress August 14, 1876, and had for its object to provide 9 feet at low water, from Washington to its mouth, by dredging and the removal of piles and obstructions, at an estimated cost of $28,050. In the project proper the proposed draft to be provided was not specified, but work under the project was devoted to securing 9 feet at mean low water. Under this project the sum of $18,000 was appropriated, of which $17,877.12 was expended; the remainder, $122.88, was transferred to the improvement of the Pamlico and Tar Rivers, when the improvements were combined in 1880.

The Tar River (that portion of the stream above Washington) prior to improvement was obstructed by sunken logs, piles, wrecks, stumps, snags, and trees in the channel, and overhanging trees along its banks. The original project for this portion of the stream was that of 1879 (Annual Report of the Chief of Engineers for 1879, p. 700) for the removal of obstructions between Washington and Tarboro at an estimated cost of $10,000. An appropriation of $3,000 was made for this purpose in 1879, of which $2,867.27 was expended, leaving a balance of $132.73, which was transferred to the joint improvement.

In 1889 the project was extended to clear the natural channel above Tarboro, 34 miles, to Little Falls, and the estimate was increased $16,200, making the total estimate $92,200.

(USACE Annual Report 1911:354) used in 1911 Results

The present project is that of 1875 (for Pamlico River) and of 1879, 1889, and 1907 (for Tar River), somewhat modified to secure a channel 100 feet wide and 9 feet deep at mean low water to Washington; thence a channel 60 feet wide and 4 feet deep at low water for 22 miles farther, to Greenville; thence a channel 60 feet wide and 20 inches deep at low water for 23 miles farther, to Tarboro; thence to keep clear of obstructions the natural channel 34 miles farther, to Little Falls, 2 miles below Rocky Mount, N. C.

The project as modified by act of March 2, 1907, in accordance with plan printed in House Document No. 342, Fifty-ninth Congress, second session, changed the depth between Washington and Greenville from 3 to 4 feet at mean low water, at an estimated cost of $3,800.

Expended prior to 1876 on previous projects		$15,000.00
Expended on present project to June 30, 1911:		
For improvement	$149,875.33	
For maintenance	31,406.16	
		181,281.49
Total		196,281.49

The expenditures during the year were $2,920.74, all for maintenance. The work consisted of snagging operations in the channel, between Washington and the mouth of Fishing Creek, which resulted in putting the channel in fair condition.

The project of 1875, with its various modifications, is completed, and at the beginning of the fiscal year there was a channel to Washington 100 feet wide and 9 feet deep at mean low water; thence to Greenville a channel 60 feet wide and 4 feet deep at low water, which is in good condition. The dredged cuts below and above Washington have slightly deteriorated during the year and will need additional dredging for maintenance during the coming year.

Above Greenville the river was snagged during the year, the worst obstructions having been removed, but it is navigable only during freshet stages of variable duration, extending over six or eight months of the year.

It is proposed to apply the available balance, together with the appropriation recommended, to maintenance of the improvement, both above and below Washington.

The stream is nontidal. Below Washington the only surface variations of importance are due to the wind, with an extreme range of 3 feet under normal conditions. Long protracted easterly or westerly winds sometimes cause variations of 7 or 8 feet. The variations of the upper portion of the river are affected by freshets only.

The head of navigation is Dunbar's Bridge, 108 miles from the mouth.

The commerce for the year 1910 amounted to 268,817 short tons, valued at approximately $6,613,520, a decrease as compared with 1909 of 41,725 tons. It consisted principally of cotton, cotton-seed products, grain, potatoes, wood, timber, lumber, fertilizer, and general merchandise.

The tendency of the improvement is to keep down freight rates.

References: Annual Reports, 1889, page 1130; 1890, page 1114; 1891, pages 1347 and 1429; 1895, page 1365; 1896, pages 161 and 1101; and 1907, page 267; Document No. 5, Fifty-fifth Congress, first session; Executive Document No. 62, Fifty-third Congress, third ses-

(USACE Annual Report 1911:355) used in 1911 Results

sion; House Document No. 289, Fifty-first Congress, second session; Executive Document No. 68, Forty-fifth Congress, third session.

July 1, 1910, balance unexpended	$5,000.00
Amount appropriated by river and harbor act approved Feb. 27, 1911	5,000.00
	10,000.00
June 30, 1911, amount expended during fiscal year, for maintenance of improvement	2,920.74
July 1, 1911, balance unexpended	7,079.26
July 1, 1911, outstanding liabilities	96.80
July 1, 1911, balance available	6,982.46
Amount required for expenditure in fiscal year ending June 30, 1913, for maintenance of improvement	[1]6,000.00

(See Appendix M 5.)

6. Bay River, N. C.—Situated on Pamlico Sound, between Pamlico and Neuse Rivers. A 10-foot channel existed originally from its mouth for a distance of 11 miles. From the head of the 10-foot channel to Bayboro, 6 miles above, the channel was obstructed by several shoals over which about 6 to 7½ feet could be carried at ordinary stages of the water. The upper portion was partially obstructed by mud flats.

The stream is 3 miles wide at its mouth, which is unobstructed by bars. The width gradually decreases to about 80 to 100 feet at Bayboro. The town of Vandemere is 10 miles from the mouth of the river; Stonewall, 15 miles; and Bayboro, 17 miles.

The present and only project for improvement, adopted by the river and harbor act approved June 25, 1910, contemplates dredging a channel 150 feet wide and 10 feet deep at mean low water through the shoals from a point 3,500 feet below Stonewall to deep water; to widen places where the existing 10-foot channel does not equal that width to the same width, and from the above-mentioned point to Bayboro to dredge a channel 100 feet wide and 10 feet deep at mean low water, at an estimated cost of $21,000, with $1,000 annually for maintenance, in accordance with report printed in House Document No. 583, Sixty-first Congress, second session.

The expenditures for the year were $14,551.73, all for improvement. The work consisted of dredging, under contract, 15,452 cubic yards of material and removing logs and stumps, which resulted in securing a channel in accordance with the project.

The additional appropriation recommended will be applied to maintenance.

The stream is nontidal and has but little current. Variations in the water level, due to winds, seldom exceed 1 or 2 feet higher or lower than the mean stage.

The head of navigation for all practical purposes is Bayboro, 17 miles from the mouth.

The commerce for 1910 amounted to 25,764 short tons, valued at $439,933. It consisted principally of fertilizers, lumber, and farm products.

References: See House Document No. 583, Sixty-first Congress, second session.

[1] Exclusive of the balance unexpended July 1, 1911.

(USACE Annual Report 1911:356) used in 1911 Results

Freight traffic.

Articles.	Amount (customary units).	Amount in short tons.	Valuation.
INBOUND.			
Brick	22,000	55	$165
Coal	48 tons	48	192
Cottonseed meal	29 tons	29	725
Fertilizer	450 tons	450	13,500
General merchandise	650 tons	650	97,500
Hay	50 tons	50	1,000
Lumber	150 M feet	300	3,0[illegible]
Machinery	92 tons	92	9,200
Oysters	1,000 bushels	40	1,000
Shingles	100 M	50	400
Total		1,764	126,682
OUTBOUND.			
Cattle	43 head	11	1,100
Cotton	350 bales	88	22,000
Cotton seed	175 tons	175	3,500
Eggs	330 crates	8	3,200
Fish	50 boxes	5	400
Grain	12,500 bushels	375	13,125
Hogs	740 head	25	2,500
Poultry	8,000 head	16	3,200
Potatoes	500 barrels	38	950
Rice, rough	600 bushels	14	700
Total		755	50,675
RECAPITULATION.			
Total inbound		1,764	126,682
Total outbound		755	50,675
Total commerce		2,519	177,357

Number of passengers transported, 1,200; receipts therefrom, $1,800.

M 5.

IMPROVEMENT OF PAMLICO AND TAR RIVERS, N. C.

[One river, called Pamlico below, and Tar above Washington, N. C.]

Reference.—See page 354 of current summary.

Snagging was carried on by the U. S. snag boat *Trent* from August 28 to September 19, 1910, when operations were suspended on account of low water, and obstructions were removed by hand from that date until the river was in fair condition. The *Trent* resumed work at the mouth of Fishing Creek on April 25 and was engaged on same until May 20, when operations ceased.

There were removed from the channel between Washington and the 55th milepost during the year 260 large snags, 80 stumps, 21 logs, 105 trees, 49 saw logs, 2¾ cords small brush, 2¾ cords small snags, and 2 old scows; and from the banks 131 trees were hauled back, 6 trees trimmed, and 3 cords of brush cut.

The cost of this work was $3,027.54, all for maintenance, distributed as follows:

Pay roll snag boat *Trent*	$1,373.99
Coal	109.90
Supplies	47.01
Subsistence	386.52

(USACE Annual Report 1911:1519) used in 1911 Results

Property	$331.05
Repairs and care of plant	394.58
Superintendence	283.94
Collecting commercial statistics	70.95
Main office expenses	29.60
Total	3,027.54

Estimate of additional funds required.

Amount that can be profitably expended in fiscal year ending June 30, 1913, for maintenance of improvement	[1] $7,500

APPROPRIATIONS.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
Prior to present project of 1875 (see H. Doc. 421, 57th Cong., 2d sess.)	$15,000	$15,000	July 13, 1892	$10,000	$88,000
Aug. 14, 1876	15,000	15,000	Aug. 18, 1894	10,000	98,000
May 3, 1879	6,000	21,000	June 3, 1896	5,000	103,000
June 14, 1880	9,000	30,000	Mar. 3, 1899	15,000	118,000
Mar. 3, 1881	8,000	38,000	June 13, 1902	35,500	153,500
Aug. 2, 1882	10,000	48,000	Mar. 3, 1905	8,000	161,500
July 5, 1884	5,000	53,000	Mar. 2, 1907	11,563	173,063
Aug. 5, 1886	5,000	58,000	Mar. 3, 1909 (allotment from "appropriation "Preservation and maintenance of river and harbor works")	5,000	178,063
Aug. 11, 1888	10,000	68,000	June 25, 1910	5,000	183,063
Sept. 19, 1890	10,000	78,000	Feb. 27, 1911	5,000	188,063

Sales, refundments, etc	$172.75
Rents	125.00
Total	297.75

COMMERCIAL STATISTICS.

Season of navigation: Navigable to Greenville the entire year, but to mouth of Fishing Creek during freshet stages extending over a period of six or eight months.

Vessel classification.

Classes.	Number.	Net registered tonnage.	Passengers.
AMERICAN.			
Registered:			
Sailing	47	1,854	1,800
Steamers	22	[illegible]	
Gasoline	11	82	
Unrigged	45	16,443	
Total	127	19,389	1,800

[1] Exclusive of the balance unexpended July 1, 1911.

(USACE Annual Report 1911:1520) used in 1911 Results

Hostler *Contentnia:*	
Pay roll	$711.50
Fuel	3.20
Subsistence supplies	234.08
Engine supplies	2.15
Other supplies	6.00
Ordinary repairs	31.68
Property and rope	101.46
Miscellaneous	23.10
Towing	139.23
Other expenses:	
Collecting commercial statistics	99.46
Care of plant	274.90
Superintendence	995.92
Main office	709.56
Total	6,555.43

At the close of the fiscal year the stream was in good condition to the mouth of Fishing Creek.

Estimate of additional funds required.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] $3,500

APPROPRIATIONS.

Date.	Amount.	Aggregate.	Date.	Amount.	Aggregate.
Prior to present project of 1875 (see H. Doc. 421, 57th Cong., 2d sess.)	$15,000.00	$15,000.00	June 3, 1896	$5,000.00	101,000.00
			Mar. 3, 1899	15,000.00	118,000.00
			June 13, 1902	35,500.00	153,500.00
			Mar. 3, 1905	8,000.00	161,500.00
Aug. 14, 1876	15,000.00	15,000.00	Mar. 2, 1907	11,563.00	173,063.00
May 3, 1879	6,000.00	21,000.00	Mar. 3, 1909 (allotment of Mar. 18, 1909, from appropriation "Preservation and maintenance of river and harbor works")	5,000.00	178,063.00
June 14, 1880	9,000.00	30,000.00			
Mar. 3, 1881	8,000.00	38,000.00			
Aug. 2, 1882	10,000.00	48,000.00			
July 5, 1884	5,000.00	53,000.00			
Aug. 5, 1886	5,000.00	58,000.00			
Aug. 11, 1888	10,000.00	68,000.00	June 25, 1910	5,000.00	183,063.00
Sept. 19, 1890	10,000.00	78,000.00	Feb. 27, 1911	5,000.00	188,063.00
July 13, 1892	10,000.00	88,000.00	July 25, 1912	100,000.00	288,063.00
Aug. 18, 1894	10,000.00	98,000.00	Sales, rents, etc	297.75	288,360.75

COMMERCIAL STATISTICS.

Season of navigation: Navigable to Greenville the entire year, but to mouth of Fishing Creek during freshet stages extending over a period of 6 or 8 months.

Vessel classification.

Class.	Number.	Net registered tonnage.	Passengers.
AMERICAN.			
Registered:			
Sailing	40	1,600	
Steamers	18	364	2,100
Gasoline	20	100	
Unrigged	50	17,500	
Total	128	20,124	2,100

[1] Exclusive of the amount available for the fiscal year, 1913.

(USACE Annual Report 1912:1740) used in 1911 results

Freight traffic.

[For the calendar year ending Dec. 31, 1911.]

Articles.	Amount (customary units.)	Amount in short tons.	Valuation.	Average haul or distance freight was carried.	Rate per ton mile.
UPSTREAM.				Miles.	
Cattle	124 head	31	$3,100	30	$0.133
Coal	4,968 tons	4,168	16,572	29	(1)
Cotton	14,136 bales	3,534	893,502	21	.099
Cotton seed	9,557 tons	9,557	191,140	21	.035
Cottonseed meal	342 tons	342	10,260	19	.128
Clams	240 bushels	12	240	28	(2)
Eggs	4,240 crates	106	42,400	21	.279
Fertilizers	33,000 tons	33,000	900,000	37	(1)
Fish	31,800 boxes	3,180	318,000	35	(1)
General merchandise	7,015 tons	7,015	1,002,250	30	.042
Grain	208,200 bushels	5,205	182,175	35	(1)
Hay	165 tons	165	4,620	20	.187
Hogs	620 head	31	6,200	15	.497
Lumber	8,375,000 feet	16,750	167,500	9	(1)
Machinery	31 tons	31	3,100	12	.333
Oysters	40,500 bushels	1,620	32,400	22	(1)
Poultry	24,500 head	49	9,800	22	.569
Peanuts	1,200 bushels	17	1,360	25	.117
Potatoes	63,100 bushels	1,894	66,255	25	.069
Shingles	60,000	30	240	48	(1)
Timber	25,350,000 feet	76,050	304,200	13	(2)
Vegetables	5,850 packages	117	2,925	25	.268
Wood	550 cords	550	2,200	31	.550
Railroad iron	633 tons	633	18,990	27	(1)
Oyster shells	14,000 bushels	350	430	13	(1)
Total		164,436	4,309,947		
DOWNSTREAM.					
Brick	72,000	180	540	29	.036
Coal	300 tons	300	1,200	23	.039
Cotton	2,816 bales	704	176,000	17	.098
Cotton seed	743 tons	743	14,860	19	.105
Cottonseed oil	976 barrels	244	19,520	3	.029
Cottonseed meal	1,255 tons	1,255	37,650	17	.089
Cottonseed hull	400 tons	400	2,200	25	.025
Fertilizers	6,198 tons	6,198	185,940	20	.038
General merchandise	6,600 tons	6,600	990,000	20	.042
Grain	12,000 bushels	300	10,500	27	.071
Hay	600 tons	600	16,800	27	.041
Horses	150 head	75	15,000	30	.067
Lumber	39,775,000 feet	79,550	795,500	31	(1)
Machinery	255 tons	255	25,500	28	.069
Peanuts	438 bushels	6	480	8	.117
Potatoes	2,500 bushels	75	2,625	8	.196
Shingles	570,000	285	2,280	34	(1)
Timber	22,284,000 feet	69,832	279,408	14	(1)
Vegetables	100 packages	2	50	8	.025
Wood	4,735 cords	4,735	18,940	19	(1)
Railroad iron	1,108 tons	1,108	33,240	14	.033
Crossties	3,504	219	1,533	10	(1)
Ice	1,400 tons	1,400	9,800	28	.033
Total		175,086	2,640,566		
RECAPITULATION.					
Total upstream		164,436	4,309,947		
Total downstream		175,086	2,640,566		
Total commerce		339,522	6,950,513		

[1] Cargo. [2] Carried by owners.

Number of passengers transported during the year, 2,100; receipts therefrom, $1,050.
Transportation lines established during the year, 1; discontinued, 1.

(USACE Annual Report 1912:1741) used in 1911 results

APPROPRIATIONS.

[For last five fiscal years only.]

None.

July 1, 1915, balance unexpended	$4,631.10
June 30, 1916, amount expended during fiscal year, for maintenance and improvement	1,878.34
July 1, 1916, balance unexpended	2,752.76

5. PAMLICO AND TAR RIVERS, N. C.

Location and description.—The two names are applied to the same river, it being known as the Pamlico below Washington, N. C., and as the Tar above that point. This stream rises in Person County, flows in a general southeasterly direction for 217 miles, and empties into Palmico Sound. (See U. S. Coast and Geodetic Survey chart No. 537.) The stream has a drainage area of about 3,608 square miles. There are no lunar tides. The Pamlico River is 38 miles long and is affected by wind tides which also influence the Tar River to a point about 20 miles above Washington. At Tarboro, 49 miles above Washington, the minimum recorded flow is 170 second-feet; the average about 2,000 second-feet; and the maximum 14,600 second-feet. The current is sluggish in the portion affected by wind tides, becoming more rapid above Greenville, 22 miles above Washington, as the fall between this point and Tarboro is 0.43 per mile. The stream is about 4½ miles wide at the mouth, 1 mile in width at Washington, 300 feet at Greenville, and 220 feet at Tarboro.

Original condition.—Prior to the improvement, begun in 1876, the river was obstructed by war blockades, sunken logs, snags, stumps, and sand shoals so that the governing low-water depths were 5 feet to Washington and perhaps 1 foot to Tarboro, to which place navigation was practicable during freshet stages only. About 3 feet could be carried to Tarboro during about eight high-water months per year. Length of navigable portion for steamers, 86 miles; for rafting, 94 miles.

Previous projects.—The first improvement of this stream was undertaken under authority of river and harbor act of July 4, 1836, modified in 1891 and 1906. For scope of previous projects, see page 1803 of the Annual Report for 1915. The amount expended on these projects was $78,800 for improvement; $16,471.11 for maintenance; total, $95,271.11.

Existing project.—The original project for Pamlico River as adopted by the river and harbor act of August 14, 1876, was to provide 9 feet at low water from Washington to the mouth at an estimated cost of $28,050. This was combined in 1880 with the original project for Tar River, adopted by the river and harbor act of May 3, 1879, for the removal of obstructions between Washington and Tarboro, at an estimated cost of $10,000. In 1887 the project was modified to provide a depth of 20 inches and a width of 60 feet to Tarboro, and the estimate was increased to $75,000. It was again increased in 1889 to $76,000.

In 1889 the project was extended to clear the natural channel above Tarboro to Little Falls and the estimate increased $16,200, making the total estimate $92,200.

(USACE Annual Report 1916:542) used in 1916 Results

The river and harbor act of March 2, 1907 (H. Doc. No. 342, 59th Cong., 2d sess.), modified the project and changed the depth between Washington and Greenville from 3 to 4 feet at mean low water, at an estimated cost of $3,800.

The river and harbor act of July 25, 1912 (H. Doc. No. 270, 62d Cong., 2d sess., with map), further modified the project to provide an available channel depth of 10 feet at mean low water and a width of 200 feet up to Washington, and a depth of 6 feet, with width of 75 feet, thence to Greenville, at an estimated cost of $94,050 and $3,500 annually for maintenance. The estimated cost was increased in 1913 to $109,050 and in 1914 to $132,550, making the total estimated cost of the existing project $224,750. The stream is nontidal; variations in the water surface at Washington due to prevailing winds seldom exceed 2 feet. The length of section under improvement is 87 miles, extending from a point 4 miles below Washington to Little Forks.

Operations and results during the fiscal year.—The river between Greenville and the mouth of Fishing Creek was maintained in good condition by snagging with Government plant and hired labor at a cost of $764.47. There were removed 108 snags, stumps, logs, etc., giving a unit cost of $7.21 per obstruction. The U. S. dredge *Hercules* extended the 200-foot channel to Washington, completing the project. She removed 43,882 cubic yards of material, 25 logs, and 43 stumps, at a cost of $8,981.15, giving a unit cost of $0.204 per cubic yard. Other expenditures were $6,815.30 for purchase of and alterations to dredge *Croatan*, $7,485.09 as reimbursement to appropriation for Cape Fear River, N. C., at and below Wilmington, for expenses of dredge *Hercules*, and $1,428.78 for office expenses, etc. The total expenditures, were $16,466.24 for new work and $12,269.65 for maintenance, giving a total of $28,735.89.

Condition at end of fiscal year.—The project was completed in 1915. A channel 200 feet wide and 10 feet deep exists to Washington, giving an increase of 100 feet in width and 1 foot in depth over what was previously available. There has been some deterioration in the 6-foot dredged channel to Greenville, so that the limiting depth is now 4 feet. Between Greenville and the mouth of Fishing Creek the stream is clear of snags. The expenditures under the existing project to June 30, 1916, amounted to $222,880.73 for new work and $36,983.30 for maintenance, making a total of $259,864.03.

Local cooperation.—None.

Effect of improvement.—The effect of the improvement has been to lower freight rates and to allow vessels of deeper draft to reach Washington, N. C. Above Washington it has provided a more economical and convenient way for the handling of farm products, fertilizer, etc.

Proposed operations.—The funds available for fiscal year 1917 will be exhausted by about November, 1916, as follows:

Maintaining improvement below Greenville by operation of U. S. hydraulic dredge *Croatan*, 2 months, at $3,000	$6,000.00
Maintaining improvement between Greenville and Fishing Creek by operation of U. S. snag boat *Contentnia*, during October, 1916, 1 month, at $500	500.00
Superintendence, etc	227.86
Total	6,727.86

(USACE Annual Report 1916:543) used in 1916 Results

It is proposed to apply the amount estimated for the fiscal year 1918 as follows:

Maintaining improvement below Washington by operation of U. S. dredge *Croatan*, 1 month, at $3,000	$3,000.00
Maintaining improvement between Greenville and Fishing Creek by operation of U. S. snag boat *Contentnia*, 2 months	1,000.00
Superintendence, etc	500.00
Total	4,500.00

Recommended modifications of project.—None.

Commercial statistics.—The commerce for the calendar year 1915 amounted to 286,716 short tons, valued at $3,937,502.40, all of which passed over the improved sections of the waterway. It consisted principally of cotton, fish, fertilizer, fertilizer material, grain, general merchandise, lumber, and machinery.

Of the commerce transported 106,795 tons of coal, fertilizer, fertilizer material, gravel, and lumber, valued at $1,279,788, were carried by schooners and barges drawing from 6 to 9 feet; 43,931 tons of general merchandise, farm and water products, etc., valued at $2,249,744.40, were carried by sail, gas, and steamboats drawing from 3 to 5 feet; 135,990 tons of timber, valued at $407,970, was rafted and carried on flats drawing from 4 to 7 feet.

Comparative statement.

Calendar year.	Short tons.	Value.
1913	322,364	$5,429,622.50
1914	288,827	3,635,611.37
1915	286,716	3,937,502.40

There was no change in the character of commerce resulting from improvement. One new line was established during the year. The decrease in tonnage was caused by lumber mills handling more of their timber by rail and on account of the poor demand for poles, piles, wood, crossties, etc.; the increase in value was caused by the greater demand for lumber, which caused an increase in price and in shipments; the increase in price of fertilizer and fertilizer material, caused by the European war, and due also to a larger cotton crop. A decrease in tonnage but an increase in value was on account of a falling off in shipments of commodities of a low value per ton and an increase in shipments and price of commodities of a high value per ton.

Financial summary.

Amount expended on all projects to June 30, 1916:	
New work	$301,680.73
Maintenance	53,454.41
Total	355,135.14

Amount expended during fiscal year ending June 30.	1914	1915	1916
New work	$77,065.10	$19,050.83	$16,466.24
Maintenance	319.80	4,816.71	12,269.65
Total	77,384.90	23,867.54	28,735.89

(USACE Annual Report 1916:544) used in 1916 Results

APPROPRIATIONS.

[For last five fiscal years only.]

July 25, 1912		$100,000.00
Oct. 2, 1914		18,500.00
Mar. 4, 1915		35,800.00
July 27, 1916		4,500.00
July 1, 1915, balance unexpended		[1] 30,963.75
June 30, 1916, amount expended during fiscal year:		
For works of improvement	$16,466.24	
For maintenance of improvement	12,269.65	
		28,735.89
July 1, 1916, balance unexpended		2,227.86
Amount appropriated by river and harbor act approved July 27, 1916		4,500.00
Balance available for fiscal year ending June 30, 1917		6,727.86
Amount that can be profitably expended in fiscal year ending June 30, 1918, for maintenance of improvement		[2] 4,500.00

6. BAY RIVER, N. C.

Location and description.—This stream, lying wholly in Pamlico County, N. C., rises in the peninsula between Pamlico and Neuse Rivers and flows about 20 miles in an easterly direction to Pamlico Sound. (See U. S. Coast and Geodetic Survey chart No. 1442.) This stream is nontidal, being affected only by winds, which influence it for a distance of 20 miles. The discharge depends on prevailing winds and is impossible to measure. It has a drainage area of about 153 square miles. The current is sluggish. The fall is very small. The average width between banks is from 100 feet to 3 miles.

Original condition.—A 10-foot channel existed originally from the mouth for a distance of 11 miles. From the head of the 10-foot channel to Bayboro, 6 miles above, the channel was obstructed by several shoals, over which from 6 to 7½ feet could be carried through narrow and crooked channels at ordinary stages of water. Bayboro was the practical head of navigation for steamers, though logging and rafting could be carried on for about 1 mile above.

Previous projects.—None.

Existing project.—The existing project for improvement, adopted by the river and harbor act approved June 25, 1910, contemplates dredging a channel 10 feet deep and 150 feet wide at mean low water from deep water up to a point 3,500 feet below Stonewall and thence 100 feet wide and 10 feet deep at mean low water to Bayboro, at an estimated cost of $21,000, with $1,000 annually for maintenance. (H. Doc. No. 583, 61st Cong., 2d sess.) For small map of Bay River see House Document No. 810, Sixty-third Congress, second session. This is a nontidal stream, with no slope. Variations in the water level, due to winds, seldom exceed 1 or 2 feet above or below mean stage.

Operations and results during the fiscal year.—No field work was done during the year, no plant being available. The expenditures

[1] Amount reported last year was in error, due to the fact that a reimbursement was erroneously credited as $18.50 instead of $11.50.
[2] Exclusive of amount available for fiscal year 1917.

(USACE Annual Report 1916:545) used in 1916 Results

Freight traffic—Continued.

Commodities.	Amount in customary units.	Amount in short tons.	Value.
INBOUND—continued.			
Cottonseed meal	48 tons	48	$1,584.00
Dry goods	63 tons	63	47,250.00
Fertilizer	1,066 tons	1,066	37,310.00
Furniture	6 tons	6	750.00
Gasoline	640 barrels	112	5,824.00
Gasoline (bulk)	7,773 gallons	27	1,296.00
Groceries	691 tons	691	86,375.00
Hardware	140 tons	140	19,600.00
Hay	67 tons	67	1,608.00
Horses	77 head	39	7,800.00
Ice	75 tons	75	525.00
Kerosene	441 barrels	80	2,400.00
Lumber	259,000 feet, b. m	518	5,180.00
Lime	967 barrels	121	1,113.20
Lime (bulk)	30 tons	30	225.00
Machinery	190 tons	190	19,000.00
Piles	15	4	32.00
Potatoes, Irish	494 bushels	15	495.00
Salt	759 sacks	53	424.00
Soft drinks	581 crates	36	1,152.00
Shingles	33,700	17	170.00
Total		12,726	278,459.70
RECAPITULATION.			
Total outbound		3,001	194,722.00
Total inbound		12,726	278,459.70
Grand total		15,727	473,181.70

5. PAMLICO AND TAR RIVERS, N. C.

The work of the year consisted of dredging for the purpose of obtaining a channel 200 feet wide and 10 feet deep at mean low water from Pamlico Sound to Washington, N. C., and maintaining by snagging a channel from Washington to the mouth of Fishing Creek. This work has been carried on entirely by Government plant and hired labor at a cost of $25,474.79.

The U. S. hoister *Contentnia* started active operations on Tar River on December 24, 1915, and to January 25, 1916, removed between Greenville and the mouth of Fishing Creek a total of 33 large logs, 9 stumps, 21 snags, 12 saw logs, 10 trees, and 1 old wreck from the channel, and cut and hauled back 20 trees from the banks. This work was accomplished at a cost of $764.47, which gives a unit cost of $7.21 per obstruction or threatened obstruction removed.

The U. S. dredge *Hercules* was at work on this improvement at the beginning of the present fiscal year at a point about 200 feet below the Washington and Vandemere railroad bridge. From July 1 to August 11, 1915, inclusive, she removed a total of 43,882 cubic yards of material, 25 logs, and 43 stumps, completing the channel to the bridge. This work was done at a cost of $8,981.15, or a cost of 20.4 cents per cubic yard, including logs and stumps. In addition $7,485.09 was paid the appropriation for Cape Fear River, N. C., at and below Wilmington for use of dredge *Hercules* and attendant plant.

(USACE Annual Report 1916:2191) used in 1916 Results

Other expenses were $6,815.30 for payment for and alterations to the hydraulic dredge *Croatan* and $1,428.78 in payment for district and field office expenses and for collecting commercial statistics.

As a result of the year's work the 200-foot channel has been completed to Washington with a minimum depth of 10 feet, and the channel from Washington to the mouth of Fishing Creek has been thoroughly snagged and is in good condition.

APPROPRIATIONS.

Prior to present project (see H. Doc. 1491, 63d Cong., 3d sess., p. 520)		$30,000
Present project:		
May 3, 1879	$6,000	
June 14, 1880	9,000	
Mar. 3, 1881	8,000	
Aug. 2, 1882	10,000	
July 5, 1884	5,000	
Aug. 5, 1886	5,000	
Aug. 11, 1888	10,000	
Sept. 19, 1890	10,000	
July 13, 1892	10,000	
Aug. 18, 1894	10,000	
June 3, 1896	5,000	
Mar. 3, 1899	15,000	
June 13, 1902	35,500	
Mar. 3, 1905	8,000	
Mar. 2, 1907	11,563	
Mar. 3, 1909 (allotted Mar. 18, 1909)	5,000	
June 25, 1910	5,000	
Feb. 27, 1911	5,000	
July 25, 1912	100,000	
Oct. 2, 1914	18,500	
Mar. 4, 1915 (allotted Apr. 2, 1915)	35,800	
July 27, 1916	4,500	
		331,863
Total		361,863

COMMERCIAL STATISTICS.

Season of navigation, 1915: Navigable to Greenville during the entire year; above Greenville during freshet stages only.

Vessel classification.

Classes.	American.	Net registered tonnage.
Registered:		
Sailing	44	561
Steamers	12	488
Gasoline	40	330
Barges	24	9,393
Total	120	10,772

Number of passengers transported during the year, about 8,000.

(USACE Annual Report 1916:2192) used in 1916 Results

removed from cuts aggregating 6,750 feet in length, 60, 80, and 100 feet wide, and 6½ to 7 feet deep, a total of 53,613.9 cubic yards of material. This work was done at a cost of $6,422.11, giving a unit cost of 12 cents per cubic yard.

Other expenditures were $645.22 for district and field office expenses and for collecting commercial statistics.

As a result of the year's work, the channel from Washington to the mouth of Fishing Creek has been thoroughly snagged and is in good condition. The project depth between Washington and Greenville was restored, but has since deteriorated, so that at the end of the year only a 4-foot depth and a 50-foot width was available.

APPROPRIATIONS.

Prior to present project (see H. Doc. 421, 57th Cong., 2d sess.)		$15,000
Present project:		
Aug. 14, 1876	$15,000	
Mar. 3, 1879	6,000	
June 14, 1880	9,000	
Mar. 3, 1881	8,000	
Aug. 2, 1882	10,000	
July 5, 1884	5,000	
Aug. 5, 1886	5,000	
Aug. 11, 1888	10,000	
Sept. 19, 1890	10,000	
July 13, 1892	10,000	
Aug. 18, 1894	10,000	
June 3, 1896	5,000	
Mar. 3, 1899	15,000	
June 13, 1902	35,500	
Mar. 3, 1905	8,000	
Mar. 2, 1907	11,562	
Mar. 3, 1909 (allotted Mar. 18, 1909)	5,000	
June 25, 1910	5,000	
Feb. 27, 1911	5,000	
July 25, 1912	100,000	
Oct. 2, 1914	18,500	
Mar. 4, 1915 (allotted Apr. 2, 1915)	[1] 37,200	
July 27, 1916	4,500	
Aug. 8, 1917 (allotment)	4,500	
		352,763
Total		367,763

COMMERCIAL STATISTICS.

Season of navigation, 1916: Navigable to Greenville during the entire year; above Greenville, during freshet stages only.

Vessel classification.

Classes.	American.	Net registered tonnage.
Registered:		
Sailing	55	1,707
Steamers	15	491
Gasoline	38	352
Barges	24	9,536
Total	132	12,086

Number of passengers transported during the year, about 10,000.

[1] Increased by $1,400 transferred from allotment for Smiths Creek, Oct. 25, 1916.

(USACE Annual Report 1917:2281) used in 1916 Results

Freight traffic.

Commodities.	Amount in customary units.	Amount in short tons.	Value.	Average haul.	Rate per ton-mile.
DOWNSTREAM.				*Miles.*	
Bricks	287,000	718	$1,723.20	29	(1)
Cement	317 tons	317	3,645.50	10	(1)
Coal	5,824 tons	5,824	34,944.00	7	(1)
Cotton	515 bales	129	45,150.00	40	$0.039
Cottonseed oil	486 barrels	121	27,043.50	48	.031
Cotton seed	262 tons	262	15,720.00	15	.120
Cottonseed hulls	502 tons	502	8,534.00	30	.060
Cottonseed meal	724 tons	724	29,684.00	30	.060
Cross ties	1,[illegible]0	81	777.60	30	(2)
Dry goods	236 tons	236	212,400.00	30	.133
Empty oil barrels	32	1	25.00	19	.079
Eggs	700 crates	18	5,400.00	15	.263
Fish, salt	202 barrels	10	1,500.00	15	(2)
Furniture	53 tons	53	7,950.00	25	.140
Fertilizer	2,297 tons	2,297	68,910.00	30	(1)
Gasoline	729 barrels	128	8,064.00	30	(2)
Grain	8,723 bushels	218	7,848.00	30	(1)
Groceries	1,668 tons	1,668	291,900.00	29	.069
Hardware	265 tons	265	55,650.00	29	.069
Hay	339 tons	339	8,475.00	31	.064
Hogs	65 head	3	600.00	30	.067
Horses	20 head	10	2,000.00	38	.105
Ice	1,679 tons	1,679	11,753.00	30	(2)
Kerosene	914 barrels	167	5,511.00	29	.052
Lumber	34,825,000 feet b. m	69,650	557,200.00	30	(1)
Lime	980 barrels	98	1,225.00	29	.052
Machinery	364 tons	364	36,400.00	20	(2)
Oysters	369 bushels	15	187.50	20	(1)
Peanuts	1,100 b[illegible]	15	1,500.00	48	.042
Potatoes, Irish	1,3[illegible]7 bu[illegible]	41	2,747.00	29	.069
Railroad iron	470 tons	470	18,800.00	20	(2)
Salt	3,480 sacks	244	2,318.00	29	.052
Soft drinks	7,607 crates	475	15,200.00	30	.060
Shingles	572,000	286	2,860.00	30	(1)
Tar	498 barrels	75	1,125.00	35	.043
Timber	27,740,000 feet b. m	68,220	225,126.00	16	(2)
Wood	334 cords	334	1,336.00	29	(2)
Miscellaneous	125 tons	125	6,250.00	30	.....
Total	.....	156,182	1,727,482.30	.....	.....
UPSTREAM.					
Brick	10,000	25	$60.00	38	(1)
Cattle	1,189 head	297	59,400.00	30	.133
Coal	5,142 tons	5,142	30,852.00	38	(1)
Cement	820 tons	820	9,430.00	38	(1)
Cotton	5,353 bales	1,338	468,300.00	30	.067
Cottonseed	4,550 tons	4,550	273,000.00	30	.060
Cottonseed hulls	32 tons	32	544.00	17	.106
Cotton seed meal	430 tons	430	17,630.00	20	.090
Clams	159 bushels	8	240.00	38	(2)
Dry goods	24 tons	24	21,600.00	48	.084
Eggs	3,312 crates	83	24,900.00	28	.143
Empty oil barrels	1,974	74	1,850.00	30	.133
Fertilizer	2,473 tons	2,473	74,190.00	31	(1)
Fertilizer material	17,849 tons	17,849	446,225.00	38	(1)
Fish, fresh	24,884 boxes	2,488	248,800.00	35	(2)
Fish, salt	2,620 barrels	131	19,650.00	38	(2)
Furniture	7 tons	7	1,050.00	25	.140
Gravel	2,000 tons	2,000	3,500.00	38	(1)
Gasoline	94 barrels	16	1,008.00	30	(2)
Gasoline, bulk	124,959 gallons	434	24,738.00	20	(2)
Grain	264,108 bushels	6,603	237,708.00	35	(1)
Groceries	776 tons	776	135,800.00	38	.055
Hardware	37 tons	37	7,770.00	48	.042
Hay	212 tons	212	5,300.00	40	.050
Hogs	2,891 head	145	29,000.00	29	.069
Kerosene	54 barrels	10	330.00	30	.050
Do	31,530 gallons	118	3,186.00	38	(2)
Lime	654 barrels	65	812.50	15	.100
Lime, bulk	295 tons	295	2,212.50	30	(1)
Lumber	5,840,000 feet b. m	11,680	93,440.00	10	(1)
Oysters	71,055 bushels	2,842	35,525.00	33	(2)
Plaster	75 tons	75	937.50	38	(1)
Poultry	25,574 head	51	10,200.00	30	.167

[1] Cargo. [2] Carried by owners.

(USACE Annual Report 1917:2282) used in 1916 Results

Freight traffic—Continued.

Commodities.	Amount in customary units.	Amount in short tons.	Value.	Average haul.	Rate per ton-mile.
UPSTREAM—continued.				*Miles.*	
Peanuts	2,749 bushels	38	$3,800.00	20	$0.100
Potatoes, Irish	22,079 bushels	662	44,354.00	25	.089
Potatoes, sweet	10,515 bushels	315	7,875.00	50	.040
Salt	14,328 sacks	1,003	9,528.50	38	(1)
Shells	17,200 bushels	430	860.00	20	(1)
Shingles	9,000	5	50.00	25	.032
Tobacco	59 tons	59	24,780.00	20	.100
Timber	19,559,000 feet b. m.	58,677	193,634.10	12	(2)
Vegetables	782 packages	39	975.00	30	.067
Wood	36 cords	36	144.00	20	(2)
Watermelons	25,000	250	3,750.00	30	(2)
Miscellaneous	62 tons	62	3,100.00	38	
Total		122,706	2,582,039.10		
RECAPITULATION.					
Total downstream		156,182	1,727,482.30		
Total upstream		122,706	2,582,039.10		
Grand total		278,888	4,309,521.40		

[1] Cargo. [2] Carried by owners.

5. FISHING CREEK, N. C. (A5).

No work was done during the year. The expenditures, $285.41, were for repairs and alterations to the U. S. snagboat *Contentnea*.

APPROPRIATIONS.

Sept. 19, 1890	$10,000	Oct. 2, 1914 (allotted Oct. 7, 1914)	$1,000
July 13, 1892	5,000	Mar. 4, 1915 (allotted Apr. 2, 1915)	1,000
Mar. 3, 1899	7,750	July 27, 1916	1,000
June 13, 1902	2,000	Total	32,750
Mar. 3, 1905	500		
June 25, 1910	1,500		
July 25, 1912	1,500		
Mar. 4, 1913	1,500		

COMMERCIAL STATISTICS.

Season of navigation, 1916: Navigable for about three months.

Vessel classification.

Classes.	American.	Net registered tonnage.
Registered steamer	1	46

(USACE Annual Report 1917:2283) used in 1916 Results

Comparative statement

Calendar year	General commerce		Passengers	Calendar year	General commerce		Passengers
	Short tons	Value			Short tons	Value	
1919	6,723	$715,786	3,500	1922	4,116	$322,579	500
1920	8,735	887,955	3,500	1923	23,212	582,074	400
1921	8,426	458,307	1,000				

Financial summary

Amount expended on all projects to June 30, 1924, after deducting receipts from sales, etc., amounting to $1,000.00:	
New work	88,550.98
Maintenance	9,113.78
Net total expended	17,664.76
Total appropriations to date of this report	17,664.76

Fiscal year ending June 30	1920	1921	1922	1923	1924
Expended for new work					
Expended for maintenance [1]	$111.96	$2,866.56	$194.34	$1,102.97	
Appropriated or allotted		3,069.76			

[1] Not deducting receipts from sales, etc.

2. PAMLICO AND TAR RIVERS, N. C.

Location and description.—The two names are applied to the same river, it being known as the Pamlico below Washington, N. C., and as the Tar above that point. This stream rises in Person County, flows in a general southeasterly direction for 217 miles, and empties in Pamlico Sound. The stream has a drainage area of about 3,608 square miles. The Pamlico River is 38 miles long. There are no lunar tides. At Tarboro 49 miles above Washington, the minimum recorded flow is 170 second-feet, the average about 2,000 second-feet, and the maximum 14,600 second-feet. The current is sluggish in the portion affected by winds, becoming more rapid above Greenville, 22 miles above Washington, as the fall between this point and Tarboro is 0.43 foot per mile. The stream is about 4½ miles wide at the mouth, 1 mile at Washington, 300 feet at Greenville, and 220 feet at Tarboro. (See U. S. Coast and Geodetic Survey chart No. 537.)

Original condition.—The river was obstructed by war blockades, sunken logs, snags, stumps and sand shoals, so that the governing low-water depths were 5 feet to Washington and perhaps 1 foot to Tarboro, to which place navigation by steamers was practicable during freshet stages only. About 3 feet could be carried to Tarboro during about eight high-water months per year, January to August, inclusive. The length of portion navigable for steamboats was 86 miles and for rafting 94 miles.

Previous project.—The first improvement of this stream was undertaken under authority of river and harbor act of July 4, 1836. For further details of previous projects see page 1803 of the Annual Report for 1915. The amount expended on this project was $15,000.

(USACE Annual Report 1924:522) used in 1924 Results

Existing project.—This provides for a channel 10 feet deep at mean low water and 200 feet wide up to Washington; 6 feet deep and 75 feet wide to Greenville; 20 inches deep and 60 feet wide to Tarboro; thence to clear the natural channel above Tarboro to Little Falls. The length of section under improvement is 87 miles, extending from a point 4 miles below Washington to Little Falls. The stream is nontidal; variations in the water surface at Washington, due to prevailing winds, seldom exceeds 2 feet. The extreme range of the flood or freshet stage for the upper section is 20 feet at Tarboro. For the lower section, observations covering a period of four years show an extreme range due to winds of 8.3 feet. The estimate of cost for new work, revised in 1914, is $228,550, exclusive of amount expended under previous project. The latest (1917) approved estimate for annual cost of maintenance is $10,000.

The existing project was authorized by the following river and harbor acts: The act of August 14, 1876, authorized a channel of 9 feet from the mouth to Washington; the river and harbor act of May 3, 1879, provided for the section of the river between Washington and Tarboro (H. Doc. No. 68, 45th Cong., 3d sess.); the section of the river between Tarboro and Little Falls (Rocky Mount) was added to the project in 1890 as a result of a preliminary examination authorized by the river and harbor act approved August 11, 1888 (Annual Report for 1889, p. 1130); the river and harbor act of March 2, 1907, authorized changing the depth between Washington and Greenville (H. Doc. No. 342, 59th Cong., 2d sess.); the river and harbor act of July 25, 1912, covered the latest modification of the portion between Washington and Greenville and authorized increase in depth from the mouth to Washington from 9 to 10 feet (H. Doc. No. 270, 62d Cong., 2d sess.). The latest published map is in the last-mentioned document.

Recommended modifications of project.—None.

Local cooperation.—None.

Terminal facilities.—The wharves on the portion of this river under improvement number 72, of which 50 are along the water front at Washington, 1 on Castle Island in front of town, 2 across the river from town, 8 between Washington and the mouth and 11 between Washington and the mouth of Fishing Creek. They are generally of timber construction with pile foundation. They have a frontage varying from 8 to 410 feet, the total frontage being 4,800 feet. Of those at Washington, 44 are private, with a frontage of 3,949 feet; 3 are owned by the railroads, with a frontage of 260 feet; 2 are owned by the city, with a frontage of 282 feet; and 1 is owned by the United States, with a frontage of 188 feet. The city wharves are open to use by all water carriers free; the railroad wharves are open to all on equal terms; vessels are usually permitted to tie up at the private wharves when not in use by the owners. The city acquired 150 feet of frontage with a view of building a public terminal, but this site is now leased to private parties. The existing facilities are not considered adequate at Washington, Greenville, or Tarboro. (For a full description of terminal facilities see H. Doc. No. 652, 66th Cong., 2d sess.)

Effect of improvement.—The effect of the improvement has been to lower rail and water freight rates and to allow vessels of deeper

(USACE Annual Report 1924:523) used in 1924 Results

draft to reach Washington, N. C. Above Washington it has provided a more economical and convenient way for the handling of farm products, fertilizer, etc.

Operations and results during fiscal year.—The work for the year consisted of maintenance dredging and snagging.

The U. S. dredge *Croatan*, working 20 miles above Washington, N. C., removed 19,409 cubic yards of material from four shoals, aggregating 2,525 feet in length, which resulted in restoring the channel to project dimensions between Washington and Greenville.

The U. S. derrick boat *Contentnea*, working between Washington and Tarboro, N. C., removed from the channel 7 snags, 6 stumps, 40 logs, 39 saw logs, 28 trees, 9 cords of small snags, and 460 linear feet of old jetty; from the banks 20 trees and 1 tree trimmed. This work resulted in clearing the channel between Washington and Greenville.

The total expenditures were $16,486.81, all for maintenance.

Condition at end of fiscal year.—The project was completed in 1915. A channel 10 feet deep and about 150 feet wide exists from the mouth to Washington; thence 5 feet deep and about 50 feet wide to a point about 2 miles below Greenville; thence 3 feet deep and about 50 feet wide to Greenville. From this point to the mouth of Fishing Creek only 1 foot is available at low water. The total expenditures to June 30, 1924, are $286,680.73 for new work and $107,758.87 for maintenance, a total of $394,439.60.

Proposed operations.—The funds available June 30, 1924, will be used for maintenance of the project, as follows:

Outstanding liabilities, June 30, 1924	$1,304.62
Operation derrick boat *Contentnea*, Feb. 1 to Mar. 31, 1925, two months, at $700	1,400.00
Repairs to floating plant	3,919.25
Superintendence and contingencies	600.00
Total	7,223.87

The sum of $18,250 can be profitably expended during the fiscal year ending June 30, 1926, for maintenance, as follows:

Operation dredge *Croatan*, May and June, 1926, two months, at $5,000	$10,000
Operation derrick boat *Contentnea* Oct. 1 to Nov. 30, 1925, two months, at $700	1,400
Proportionate part of cost of repairs to dredge *Croatan*	6,250
Superintendence and contingencies	600
Total	18,250

Commercial statistics.—Of the commerce for the year 164,734 tons valued at $4,704,544 passed over the improved sections. Timber, lumber, fertilizer material, and fertilizer were the principal items and were carried in barges and schooners drawing from 5 to 9 feet, except timber, which was rafted and towed; farm and water products were carried in gas, steam, and sail boats drawing from 3 to 5 feet. There was no change in the character of the commerce as a result of the improvement. One line was abandoned and none established during the year. The increase was due to larger lumber shipments and to the larger amount of freight handled by the boat line between Norfolk and Washington.

(USACE Annual Report 1924:524) used in 1924 Results

Comparative statement

Calendar year	General commerce		Timber, rafted and towed		Passengers
	Tons	Value	Tons	Value	
1919	101,495	$6,503,610	55,450	$554,500	6,000
1920	104,308	5,802,256	35,643	356,430	8,000
1921	113,367	3,598,712	31,805	127,220	8,000
1922	131,961	4,364,376	56,802	227,208	7,000
1923	148,932	5,177,072	50,528	202,112	6,000

Financial summary

Amount expended on all projects to June 30, 1924, after deducting receipts from sales, etc., amounting to $5,398.81:	$301,680.73
New work	107,758.87
Maintenance	409,439.60
Net total expended	416,063.47

Total appropriations to date of this report

Fiscal year ending June 30	1920	1921	1922	1923	1924
Expended for new work	$2,260.51	$1,733.60	$13,939.57	$11,051.63	$16,486.81
Expended for maintenance [1]		8,500.00	21,400.47	12,000.00	
Appropriated or allotted					

July 1, 1923, balance unexpended	$19,783.02
Receipts from sales, etc., during fiscal year 1924	3,927.66
	23,710.68
June 30, 1924, amount expended during fiscal year for maintenance	16,486.81
July 1, 1924, balance unexpended	7,223.87
July 1, 1924, outstanding liabilities	1,304.62
July 1, 1924, balance available	5,919.25
Amount that can be profitably expended in fiscal year ending June 30, 1926, for maintenance	[2] 18,250.00

3. FISHING CREEK, N. C.

This project was completed in 1901. No work has been done for several years, and no work is proposed for the next fiscal year. No expenditures were made during the year, and no funds are available for expenditure. The abandonment of this project has been recommended to Congress (see H. Doc. No. 1277, 64th Cong., 1st sess.). For a full description of this project see Annual Report for 1922, page 647.

[1] Not deducting receipts from sales, etc.

[2] Exclusive of available funds.

(USACE Annual Report 1924:525) used in 1924 Results

WATERWAY CONNECTING SWAN QUARTER BAY WITH DEEP BAY, N. C.—continued

Trips and drafts of vessels

Draft (feet)	Eastbound		Westbound	
	Motor vessels	Sailing	Motor vessels	Sailing
3 to 5	1,119	180	1,119	180

PAMLICO AND TAR RIVERS, N. C.

Section included: Mouth to Little Falls, N. C., 87 miles. *Controlling depth:* 10 feet at mean low water to Washington, 4 feet to Greenville, and 20 inches to Tarboro. *Project depth:* 10 feet at mean low water to Washington, 6 feet to Greenville, 20 inches to Tarboro. *Navigation season:* Navigable to Greenville the entire year; above Greenville during freshet stages which prevail for four to six months during the year.

Comparative statement of traffic

Year	Tons	Value	Year	Tons	Value
1891	195,600	(1)	1908	353,429	$7,909,369.00
1892	107,097	(1)	1909	310,542	5,500,166.00
1893	119,505	(1)	1910	268,817	6,613,520.00
1894	119,979	(1)	1911	339,522	6,950,513.00
1895	183,226	(1)	1912	355,186	7,430,484.00
1896	251,887	(1)	1913	322,364	5,429,622.50
1897	363,513	(1)	1914	288,827	3,635,611.37
1898	348,575	(1)	1915	286,716	3,937,502.40
1899	507,481	(1)	1916	278,888	4,309,521.40
1900	613,895	(1)	1917	197,308	4,699,067.00
1901	935,311	(1)	1918	200,436	6,565,562.00
1902	832,015	(1)	1919	156,943	7,058,110.00
1903	845,377	(1)	1920	139,951	6,158,686.00
1904	514,401	$17,041,203.50	1921	145,772	3,725,932.00
1905	567,331	13,694,531.00	1922	188,763	4,591,584.00
1906	491,384	20,816,394.00	1923	199,460	5,379,184.00
1907	428,378	19,212,294.00	1924	163,593	6,227,447.00

[1] No statistics available.

Number passengers carried in 1920, 8,000; in 1924, 4000. No statistics for prior years.

Freight traffic, 1924

DOMESTIC

Classes and commodities	Short tons	Value	Average haul
UPBOUND			
Animals and animal products:			*Miles*
Cattle and hogs	313	$45,024	29
Fish	1,904	380,800	30
Fish scraps	312	14,040	38
Oysters	2,848	48,480	27
Oyster shells	65	260	.....
Poultry and eggs	74	35,720	24
Vegetable food products:			
Cottonseed	1,520	66,880	28
Grain	3,047	152,350	34
Groceries	5,116	2,046,400	27
Potatoes	470	17,990	23
Soft drinks	405	16,200	10
Vegetables	125	6,250	20
Watermelons	36	1,080	36
Other vegetable food products: Tobacco	2	840	15
Textiles:			
Cotton	425	213,775	26
Dry goods	20	25,000	10
Wood and paper:			
Lumber	17,234	258,510	15
Timber, round, rafted	45,729	182,916	20
All other	138	2,050	.....

(USACE Annual Report 1925:467) used in 1924 results

PAMLICO AND TAR RIVERS, N. C.—continued

DOMESTIC—Continued

Classes and commodities	Short ton	Value	Average haul
UPBOUND—continued			
Nonmetallic minerals:			*Miles*
Cement	2,775	$44,400	10
Gasoline	1,360	81,600	10
Kerosene	564	25,380	10
Lubricating oil	447	67,050	33
Salt	10	200	10
Ores, metals, and manufactures of:			
Hardware	165	66,000	20
Sheet iron	159	9,540	38
Chemicals:			
Fertilizer	7,373	221,190	18
Fertilizer material	22,373	604,071	36
Unclassified: Miscellaneous	21	1,050	38
Total upbound	115,030	4,635,046	.....
DOWNBOUND			
Vegetable food products:			
Cottonseed hulls	189	3,780	25
Cottonseed meal	146	5,840	26
Grain	325	16,250	25
Groceries	1,365	546,000	23
Hay	385	15,400	29
All other	77	3,130	.....
Textiles:			
Cotton	93	46,779	27
Dry goods	53	66,250	30
Wood and paper:			
Lumber	38,272	574,080	38
Laths	100	1,200	38
Poles	306	4,590	38
Shingles	107	3,210	21
Timber, round, rafted	651	2,604	10
Wood	175	1,400	.....
All other	71	9,450	.....
Nonmetallic minerals:			
Brick	613	3,678	25
Coal	443	2,215	24
Cement	115	1,840	30
Gasoline and kerosene	118	6,405	.....
All other	113	2,545	.....
Ores, metals, and manufactures of:			
Hardware	125	50,000	25
Railroad iron	368	14,720	19
Machinery and vehicles: Machinery	260	78,000	20
Animals and animal products: Oysters, canned	105	26,250	.....
Chemicals: Fertilizer	3,320	99,600	27
Unclassified:			
Ice	530	4,240	36
All other	138	2,945	.....
Total downbound	48,563	1,592,401	.....
Total upbound and downbound	163,593	6,227,447	.....

SUMMARY

Classes of commodities	Domestic				Total	
	Upbound		Downbound			
	Tons	Value	Tons	Value	Tons	Value
Animals and animal products	5,516	$524,324	105	$26,250	5,621	$550,574
Vegetable food products	10,719	2,307,150	2,487	590,400	13,206	2,897,550
Other vegetable products	2	840	.....	.....	2	840
Textiles	445	238,775	146	113,029	591	351,804
Wood and paper	63,101	443,476	39,682	596,534	102,783	1,040,010
Nonmetallic minerals	5,156	218,630	1,402	16,683	6,558	235,313
Ores, metals, and manufactures of	324	75,540	493	64,720	817	140,260
Chemicals	29,746	825,261	3,320	99,600	33,066	924,861
Machinery and vehicles	.....	.....	260	78,000	260	78,000
Unclassified	21	1,050	668	7,185	689	8,235
Total	115,030	4,635,046	48,563	1,592,401	163,593	6,227,447

(USACE Annual Report 1925:468) used in 1924 Results

PAMLICO AND TAR RIVERS, N. C.—continued

Vessel classification, 1924

Classes of vessels	American	Aggregate tonnage	Passengers
Upbound:			
Steamers	750	33,200	
Motor vessels	4,214	28,042	2,000
Sailing	415	3,045	
Barges	33	15,505	
Total	5,412	79,792	
Downbound:			
Steamers	750	33,200	
Motor vessels	4,214	28,042	2,000
Sailing	415	3,045	
Barges	33	15,505	
Total	5,412	79,792	
Total up and down bound	10,824	159,584	4,000

Trips and drafts of vessels

Draft (feet)	Upbound				Downbound			
	Steamers	Motor vessels	Sailing	Barges	Steamers	Motor vessels	Sailing	Barges
3 to 7	750				750			
3 to 5		4,214	415			4,214	415	
8 to 9				10				33
6				23				
Total	750	4,214	415	33	750	4,214	415	33

During the yea tabout 10 flats or lighters were employed on this waterway carrying lumber, fertilizer, and logging supplies.

FISHING CREEK, N. C.

No commerce in 1924

SOUTH RIVER, N. C.

Section included: Mouth to Idalia, N. C. *Controlling depth:* 7 feet at mean low water. *Project depth:* 7 feet at mean low water. *Navigation season:* Navigable the entire year

Comparative statement of traffic

Year	Tons	Value	Passengers	Year	Tons	Value	Passengers
1910	26,071	$167,230		1918	21,485	$982,722	
1911	44,350	370,382		1919	20,825	716,289	
1912	77,791	426,423		1920	13,084	473,667	1,500
1913	61,985	540,505		1921	15,832	469,385	1,000
1914	45,070	277,125		1922	16,921	366,442	600
1915	34,643	219,932		1923	12,922	342,459	400
1916	33,102	298,286		1924	8,994	434,403	300
1917	31,141	452,907					

(USACE Annual Report 1925:469) used in 1924 Results

Cost and financial summary

Cost of new work to June 30, 1943	$404,584.34
Cost of maintenance to June 30, 1943	181,205.04
Total cost of permanent work to June 30, 1943	585,789.38
Net total expenditures	585,789.38
Unexpended balance June 30, 1943	6,000.00
Total amount appropriated to June 30, 1943	591,789.38

Fiscal year ending June 30	1939	1940	1941	1942	1943
Cost of new work	$226.62	$4,279.04	$107,175.81	$35,765.46	
Cost of maintenance	20,406.56	2,577.33	16,103.74	1,054.36	
Total cost	20,633.18	6,856.37	123,279.55	36,819.82	
Total expended	20,633.18	6,847.62	105,479.86	44,628.26	
Allotted	336,000.00		−156,000.00		−$19,391.50

Balance unexpended July 1, 1942	$25,391.50
Deductions on account of revocation of allotment	19,391.50
Net amount to be accounted for	6,000.00
Balance unexpended June 30, 1943	6,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1945, for maintenance [1]	6,000.00

[1] Exclusive of available funds.

3. PAMLICO AND TAR RIVERS, N. C.

Location.—The two names are applied to the same river, it being known as the Pamlico below Washington, N. C., and as the Tar above that point. This stream rises in Person County, flows in a general southeasterly direction for 217 miles, and empties into Pamlico Sound. The Pamlico River is 38 miles long. (See U. S. Coast and Geodetic Survey Chart No. 537.)

Previous projects.—Adopted by River and Harbor Acts of July 4, 1836, and August 30, 1852. For further details see page 502 of Annual Report for 1938.

Existing project.—This provides for a channel 12 feet deep at mean low water and 200 feet wide from the 12-foot contour in the river below Washington to the Atlantic Coast Line Railroad bridge at Washington; 12 feet deep and 100 feet wide from Washington to a turning basin of the same depth, 200 feet wide and 300 feet long, in Hardee Creek, 1,500 feet above its mouth; 6 feet deep and 75 feet wide to Greenville; 20 inches deep and 60 feet wide to Tarboro; thence to clear the natural channel above Tarboro to Little Falls. The length of section under improvement is 97 miles, extending from a point 14 miles below Washington to Little Falls. The stream is nontidal; variations in the water surface at Washington, due to prevailing winds, seldom exceed 2 feet. The extreme range of the flood or freshet stage for the upper section is 34 feet at Tarboro. For the lower section, the extreme range due to winds is 8.3 feet.

(USACE Annual Report 1943:427) used in 1943 Results

The estimate of cost for new work, revised in 1937, was $754,000, exclusive of amount expended on previous project. The latest (1937) approved estimate for annual cost of maintenance is $66,000.

The existing project was authorized by the following river and harbor acts:

Acts	Work authorized	Documents
Aug. 14, 1876	Channel 9 feet deep and 100 feet wide from the mouth to Washington.	
Mar. 3, 1879	Clearing the channel to Tarboro	H. Doc. No. 68, 45th Cong., 3d sess., and Annual Report, 1879, p. 700.
Aug. 11, 1888	Clearing the channel between Tarboro and Little Falls (Rocky Mount).	Annual Report, 1889, p. 1130.
Mar. 2, 1907	Channel 4 feet deep and 60 feet wide between Washington and Greenville.	H. Doc. No. 342, 59th Cong., 2d sess.
July 25, 1912	A 10-foot depth and 200-foot width from the mouth to Washington, thence 6-foot depth and 75-foot width to Greenville.	H. Doc. No. 270, 62d Cong., 2d sess.[1]
July 3, 1930	Present 12-foot project to the Atlantic Coast Line R. R. bridge at Washington.	Rivers and Harbors Committee Doc. No. 11, 71st Cong., 1st sess.[1]
Aug. 26, 1937	Present 12-foot project from Washington to a turning basin in Hardee Creek.	Rivers and Harbors Committee Doc. No. 22, 75th Cong., 1st sess.[1]

[1] Contains latest published maps.

Recommended modifications of project.—The abandonment of this improvement above Tarboro, N. C., is recommended in House Document No. 467, Sixty-ninth Congress, first session.

Local cooperation.—Fully complied with.

Terminal facilities.—There are 54 wharves on the portion of this river under improvement, of which 34 are along the water front at Washington, 19 between Washington and the mouth, and only 1 in usable condition above Washington. They have a total frontage of 3,570 feet. The existing facilities are considered adequate for existing commerce.

Operations and results during fiscal year.—The work for the year consisted of maintenance dredging by contract and miscellaneous surveys. Between July 1 and 22, 1942, the contract dredge *Sadye M*, removed 58,614 cubic yards net (81,215 gross) of material from the channel between Washington and Hardee Creek. The total costs were $9,820.81 all for maintenance. The expenditures were $28,866.38.

Condition at end of fiscal year.—The existing project was completed in 1939. The controlling mean low water depths at the close of the year were 12 feet to Washington, 12 feet to Hardee Creek, 3.5 feet to Greenville and 1 foot to the mouth of Fishing Creek. The total costs under the existing project to June 30, 1943, were $674,651.38 for new work and $429,943.43 for maintenance, a total of $1,104,594.81.

Proposed operations.—The balance unexpended July 1, 1943, $9,610.12, has been reported for revocation.

The sum of $66,000 can be profitably expended during the fiscal year 1945, and will be applied to maintenance as follows:

(USACE Annual Report 1943:428) used in 1943 Results

Dredging channel at and below Washington, under contract during June 1945	$17,000
Dredging the channel between Washington and Hardee Creek, under contract, during April and May 1945	44,000
Snagging between Washington and Hardee Creek with the U. S. derrick boat *Continenea* and/or tractors between February 1, and April 30, 1945	5,000
Total for all work	66,000

Cost and financial summary

Cost of new work to June 30, 1943	$689,651.38
Cost of maintenance to June 30, 1943	429,943.43
Total cost of permanent work to June 30, 1943	1,119,594.81
Net total expenditures	1,119,594.81
Unexpended balance June 30, 1943	9,610.12
Total amount appropriated to June 30, 1943	1,129,204.93

Fiscal year ending June 30	1939	1940	1941	1942	1943
Cost of new work	$2,361.78	$241,401.08			
Cost of maintenance	374.28	3,372.89	$48,077.66	$62,131.76	$9,820.81
Total cost	2,736.06	244,773.97	48,077.66	62,131.76	9,820.81
Total expended	2,746.20	244,973.02	48,077.66	43,156.19	28,866.38
Allotted	−38,300.00	19,000.00	53,000.00	18,100.00	

Balance unexpended July 1, 1942	$38,476.50
Gross amount expended	28,866.38
Balance unexpended June 30, 1943	9,610.12
Amount that can be profitably expended in fiscal year ending June 30, 1945, for maintenance.[1]	66,000.00

[1] Exclusive of available funds.

4. SILVER LAKE HARBOR, N. C.

Location.—Silver Lake Harbor is located at the westerly end of Ocracoke Island, which is a portion of the barrier separating Pamlico Sound from the Atlantic Ocean. Beaufort Harbor lies about 50 miles southwest; Belhaven is about 60 miles northwest. (See U. S. Coast and Geodetic Survey Chart No. 1232.)

Existing project.—This provides for a channel 10 feet deep from that depth in Pamlico Sound to and including an anchorage basin of the same depth in Silver Lake Harbor, with widths of 100 feet across Big Foot Slough bar, and 60 feet in the entrance channel, together with a training wall 300 feet long to protect the outer end of the entrance channel from northeast storms. The ordinary range of tide is about 1 foot within the lake and about 2½ feet at the outer end of the connecting channel. Severe storm tides have been known to raise the water surface of the lake as much as 5 feet.

The estimate of cost for new work, revised in 1941, is $71,000. The latest (1941) approved estimate for annual cost of maintenance is $4,900.

558155—44—pt. 1, vol. 1——28

(USACE Annual Report 1943:429) used in 1943 Results

FAR CREEK, N. C.—Continued

Freight traffic, 1943

DOMESTIC

IN-BOUND		Tons
281	Animals, live, n. o. s.	1,403
	Crabs, hard	178
	Oysters, in shell	1,225
282	Animal products, n. o. s.: *Fish, fresh*	813
450	Petroleum oils, refined	813
	Gasoline	710
	Kerosene	103
451	Fuel oil	92
701	Manufactures and miscellaneous, n. o. s.:	
	Drums, steel	22
	Total	3,153

OUT-BOUND		Tons
200	Anthracite coal	88
401	Poles and piling, n. o. i. b. n. [illegible]	347
430	Lumber shingles and lath: [illegible]	65
431	Box, crate, and cooperage materials: *Box shooks*	63
450	Petroleum oils, refined	203
	Gasoline	178
	Kerosene	25
451	Fuel oil	30
540	Cement, portland	39
620	Beverages: *Soft drinks*	137
701	Manufactures and miscellaneous	304
	Feed	56
	General merchandise	248
	Total	1,276
	GRAND TOTAL, ALL TRAFFIC	4,429

Total ton-miles, 8,858.

Trips and drafts of vessels

Draft (feet)	In-bound			Out-bound		
	Motor vessels	Sailing	Total	Motor vessels	Sailing	Total
7	5		5			
6	174		174	75		75
5	83	108	191	122		122
4	95		95	20		20
3	380		380	520	108	628
Total	737	108	845	737	108	845
Total net registered tonnage	6,488	1,080	7,568	6,488	1,080	7,568
Passengers: Regular	250		250	250		250

PAMLICO AND TAR RIVERS, N. C.

Section included: From 14 miles below Washington on Pamlico River, to Little Falls, 83 miles above Washington on Tar River, a total distance of 97 miles. There was no commerce above Greenville, 22 miles above Washington, during the year. *Controlling depth:* 11 feet at mean low water to Washington, 11 feet from Washington to Hardee Creek, 3 miles below Greenville, thence 1 foot to Tarboro. *Project depth:* 12 feet at mean low water to Hardee Creek, 6 feet to Greenville, and 30 inches to Tarboro, thence to clear natural channel above Tarboro to Little Falls. *Navigation season:* Navigable to Greenville the entire year, above Greenville during freshet stages, which prevail for 4 to 6 months during the year

Comparative statement of traffic

Year	Vessel traffic	Rafted	Total	Passengers	Year	Vessel traffic	Rafted	Total	Passengers
	Tons	Tons	Tons			Tons	Tons	Tons	
1934	82,274	63,274	145,548	1,000	1939	94,586	54,099	148,685	500
1935	74,976	60,128	135,104	1,000	1940	85,795	36,422	123,217	900
1936	84,448	89,961	174,409	1,000	1941	98,912	32,554	131,466	600
1937	84,041	89,552	173,593	500	1942	57,751	24,085	81,836	600
1938	86,398	73,564	159,962	500	1943	39,651	32,783	72,434	

(USACE Annual Report 1944:495) used in 1943 Results

PAMLICO AND TAR RIVERS, N. C.—Continued

Freight traffic, 1943

DOMESTIC

INTERNAL RECEIPTS		Tons
041	Rice: *Cleaned*	20
050	Flour, wheat	54
150	Beans and peas, dried	329
164	Products of agriculture	405
	Coffee	79
	Tapioca flour	32
281	Animals, live, n. o. s	897
	Crabs, hard	86
	Oysters, in shell	871
282	Animal products, n. o. s.: *Fish, fresh*	75
450	Petroleum oils, refined	3,266
	Gasoline	3,069
	Kerosene	197
451	Fuel oil	1,506
452	Lubricating oil	529
470	Sugar: *Cane, refined*	170
471	Sirup and molasses, edible	541
513	Iron and steel, fifth class: *Structural*	117
540	Cement, portland	45
640	Fertilizers, n. o. s.: *Fertilizer, complete*	5,744
680	Canned food products	1,465
691	Paints in oil	97
698	Soap and washing compounds	867
701	Manufactures and miscellaneous	6,655
	Bottle caps	89
	Chlorine gas	66
	Coca-Cola sirup	4,111
	Drugs	47
	Dry goods	80
	Drums, iron or steel	90
	Feed	54
	Groceries	1,857
	Hardware	304
	Paper stock	58
	Soda, baking	879
	Vinegar	46
	General merchandise	860
	Total	22,482

INTERNAL SHIPMENTS		Tons
020	Corn: *Shelled*	42
050	Flour, wheat	29
130	Potatoes, other than sweet	38
250	Anthracite coal	246
430	Lumber, shingles, and [illegible]	4,858
	Lumber, pine	4,787
	Shingles	86
431	Box shooks	30
450	Petroleum oils, refined	9,489
	Gasoline	7,414
	Kerosene	2,075
451	Fuel oil	1,083
540	Cement, portland	107
550	Brick, common	289
620	Beverages: *Soft drinks*	89
701	Manufactures and miscellaneous	874
	Barrels, wood	181
	Dry goods	60
	Drums, iron or steel	506
	Groceries	88
	Hardware	59
	General merchandise	66
	Total	17,169
	UP-BOUND	
400	Logs: *Rafted*	14,963
	DOWN-BOUND	
400	Logs: *Rafted*	17,820
	GRAND TOTAL, ALL TRAFFIC	72,434

Total ton-miles, 1,155,636.

Trips and drafts of vessels

Draft (feet)	Up-bound					Down-bound				
	Motor vessels	Sailing	Barges	Tugs	Total	Motor vessels	Sailing	Barges	Tugs	Total
11			8		8			7		7
10	79			10	89				10	10
9	67				67	35				35
8										
7				15	15	27			15	42
6	91		7	90	188	257		8	90	355
5	140	135			275	75				75
4	437				437	345				345
3	160				160	235	135	30		400
2	345				345	345				345
Total	1,319	135	15	115	1,584	1,319	135	45	115	1,614
Total net registered tonnage	23,960	1,080	8,600	2,255	35,895	23,960	1,080	32,600	2,255	59,895

(USACE Annual Report 1944:496) used in 1943 Results